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Number 3

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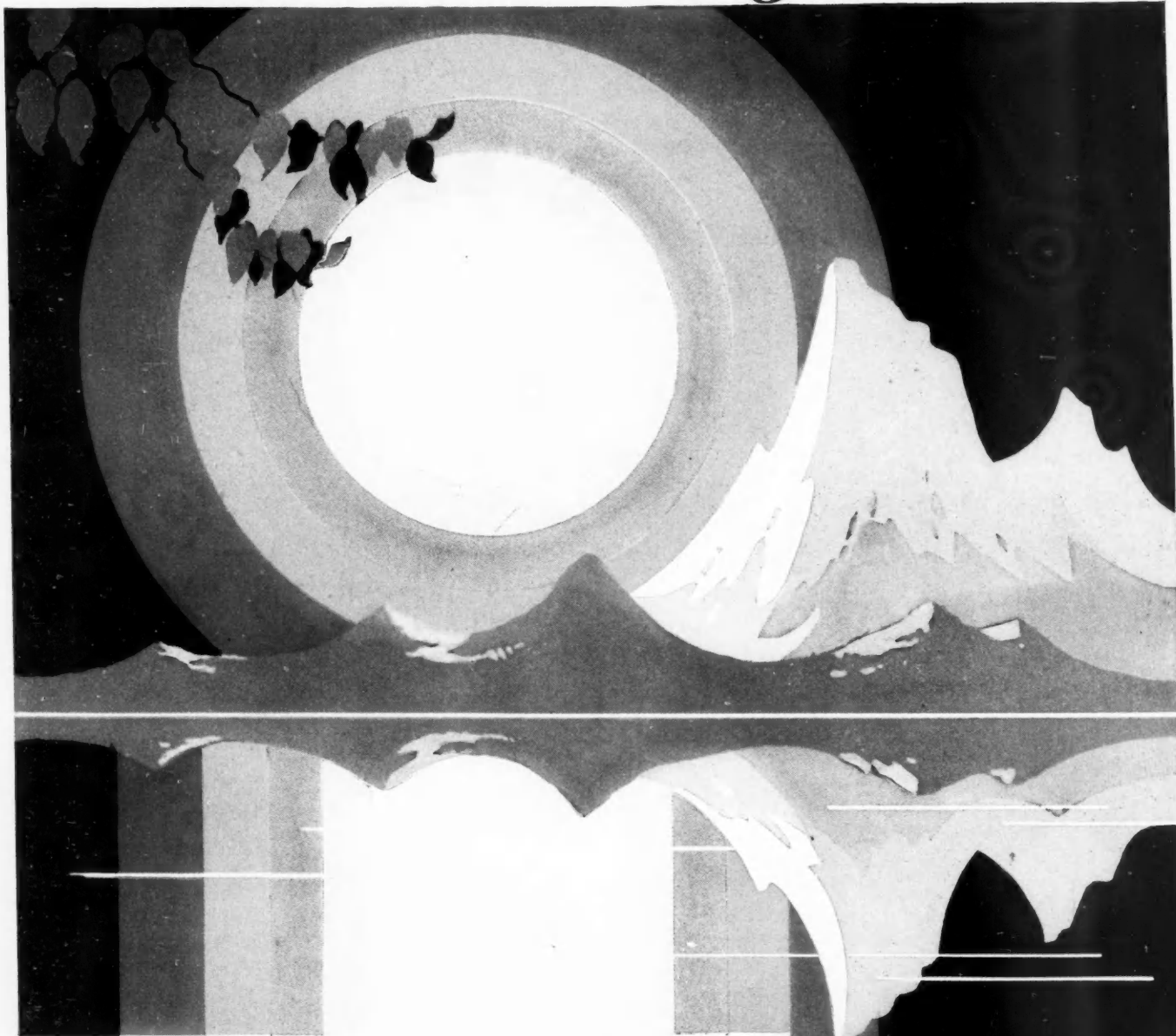
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AUTOMOTIVE INDUSTRIES

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Established 1902

Vol. 61

No. 3

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Contents

Europe to Change Horsepower Tax, Sloan Testifies at Washington. By Earl O. Ewan	73
Buick Steel-Backed Main Bearings Produced by Pressing Method. By Athel F. Denham	78
Efficient Combustion in Oil Engines is Controlled by Five Factors. By William F. Joachim	81
Just Among Ourselves	87
Special Craft Fly India Route for British Imperial Airways. By M. W. Bourdon	88
Profit Despite Capacity Production Possible by Accurate Control. By W. W. Hay	90
Tolerances in Ball Bearing Press Fits Must Be Varied to Suit Conditions	93
Boeing Plane Production Methods Emphasize Metal Treatment. By R. E. Johnson	94
New Developments	96
News of the Industry	98
Men of the Industry	104
Financial Notes	105
Calendar of Events	108
Advertisers' Index	98, 99

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Appearance



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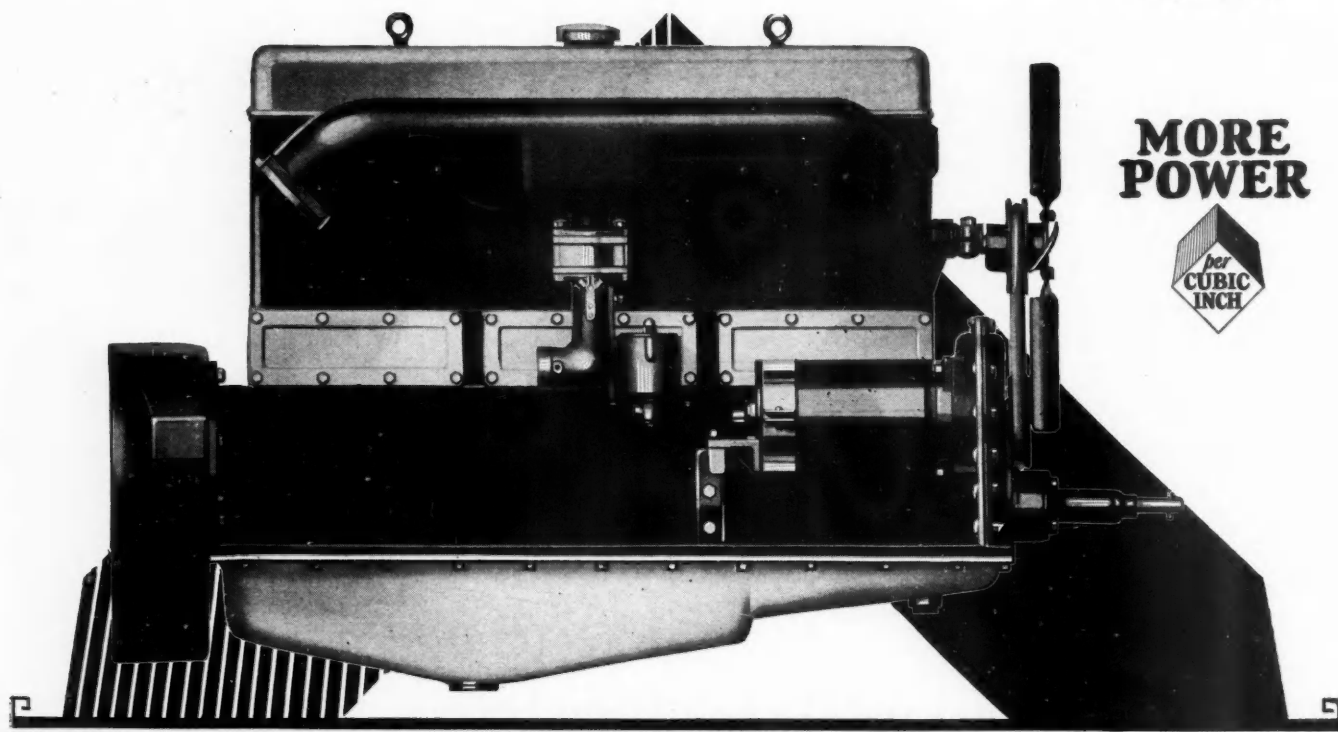
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AUTOMOTIVE INDUSTRIES

VOLUME 61

Philadelphia, Saturday, July 20, 1929

NUMBER 3

Europe to Change Horsepower Tax, Sloan Testifies at Washington

President of General Motors Corporation indicates that the manufacture of large cars will be encouraged abroad, thus giving greater competition to American makes.

By EARL O. EWAN

IT is only a question of time until the horsepower tax on automobiles in Europe will be changed to the extent that a wider market for more powerful cars will be created there, which will promote the manufacture of large cars abroad, thereby increasing the competition that American automobiles must meet, both at home and overseas. That was one of the points emphasized last week by Alfred P. Sloan Jr., president of the General Motors Corp., in testifying at Washington before the subcommittee on metals and manufactures of metals of the Senate Finance Committee relative to the automotive phase of the Hawley Tariff Bill. The bill, as passed by the House, is now in the process of revision in the Senate Finance committee.

Mr. Sloan referred to the horsepower tax situation in supporting his endorsement of the recommendation made at the hearing by Alvan Macauley, president of the National Automobile Chamber of Commerce and of the Packard Motor Car Co., for the reduction of the tariff on passenger cars from 25 to 10 per cent and the retention of the countervailing duty clause.

"Senator, I would support the recommendation Mr. Macauley made of 10 per cent," said Mr. Sloan in answering the question addressed to him on the subject by Sen-

ator David A. Reed, Republican, of Pennsylvania, who, as chairman of the sub-committee, presided at the hearing. "I do not see any danger of foreign-made cars coming into this market as we see things now.

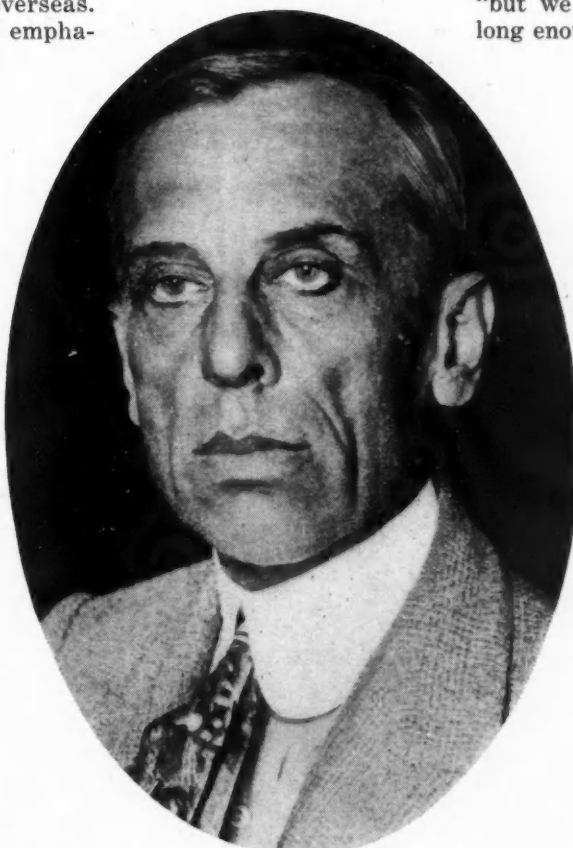
"My company is operating in Germany, and to some extent in England," continued Mr. Sloan, "but we have not been operating there long enough to know what the economics of the picture are, and it will be probably three or four years before anybody does because, besides the economics of the situation, the question of management enters into it. So I do not think there is anybody who can say positively what the future will bring forth. However, I certainly think that with 10 per cent the industry here would not in any sense be jeopardized."

"You have no intention, have you," asked Senator Reed, "of manufacturing cars in your foreign plants for importation into this country?"

"No, we have no intention of that at all, Senator," replied Mr. Sloan. "If you are willing to take the time, I will tell you what our idea is in manufacture."

"I wish you would," said Senator Reed.

"I did not want to take your time unless you desired it," continued Mr. Sloan. "We will start out with the point Mr. Macauley made that the automotive industry



Alfred P. Sloan, Jr., president of the General Motors Corp. This photograph was taken immediately after Mr. Sloan had testified before a sub-committee of the Senate Finance Committee last week

is a great wealth producing industry. You gentlemen know that."

"We know that," interjected Senator Reed. "That is why we do not want to go rashly into this revision."

"That being so, in this country," Mr. Sloan resumed, "it applies equally to other countries that are logically manufacturing in character, like France, England, Germany, and to some extent Italy. Therefore, it seems to me to be self-evident that those countries must afford adequate protection to the automotive industry. They have got to have an automotive industry to employ labor and consume materials. Furthermore, they have got to have an automotive industry because it is imperative to national defense. Therefore, there is a business there to be had. So, we feel that we can well afford to go into a country like Germany and participate in that industry. It has nothing to do with the importation by that country of American products. They are separate and distinct; one supplements the other."

Senator James Couzens, Republican, of Michigan, a member of the subcommittee, then interrupted to ask:

"In those considerations, did you have in mind that you would have any advantage in establishing a German industry in the South American business?"

"That does not enter into it at all, Senator," answered Mr. Sloan.

"It was not considered?" asked Senator Couzens.

"That will depend upon the economics of the thing as they may work out in three or four years," continued Mr.

Sloan. "It is impossible to make a car in Germany and sell it in South America today in competition with the United States product; you cannot do it."

European Taxes Heavy

"Mr. Sloan," said Senator Reed, "is it not a fact that the taxes on motor vehicles in most of the European countries are vastly heavier than they are here? I mean the operating taxes."

"Yes, I am told so," replied Mr. Sloan.

"And does not that force the manufacturers there to adopt a type with very low horsepower?" asked Senator Reed.

"Yes," answered Mr. Sloan.

"Which would not be sold in this country, which never would do here?" asked Senator Reed.

"Yes, sir," said Mr. Sloan. "For instance, take in Germany. What you refer to is the horsepower tax which, on a Ford car, or a Chevrolet car, would amount to about \$105 in our money; and that is a lot of money over there. It is about five times what the maximum tax is on any car in this country. On the average run

of cars over there, the horsepower tax would be about \$35 or \$40 due to the fact that they have a small power-plant relative to weight. That is another reason why it is impossible to manufacture over there—because you make a different type of car, Senator."

"That is just what I am driving at," said Senator Reed, "that with the policy of the horsepower tax definitely established, as it is in Great Britain and the countries on the Continent, in order for an American manufacturer to get a big market there he has to make a car with a very small engine does he not? We see that on the streets of London, for example."

"Yes, sir," answered Mr. Sloan.

"Cars that nobody would buy here seem to be very popular there," asserted Senator Couzens.

"But, Senator, you started with the wrong assumption, I think," contended Mr. Sloan. "You assumed that tax was firmly established. It is not. It is going to be changed. Recently, the German Government sent a group of government men and economists over here to study the situation in this country. I feel sure it is only a question of time before those horsepower taxes are going to be changed, because having a horsepower tax, like England has, absolutely debar them from getting any extensive market."

"That is what I mean, that that policy in itself makes importation of their cars impossible," maintained Senator Reed.

"But they are going to change that; they have got to change that policy," continued Mr.

Sloan. "But until that policy is changed, your point is correct."

Mr. Sloan explained that American automobile manufacturers have only 10 per cent of the English market, and that their sales have not been increasing in England and France. Demand for American cars has grown in Germany within the last two years, he said, but added that he did not think that had had anything to do with the economics of the situation "but is simply due to the fact that Germany has not yet got started in the automobile business." Mr. Sloan emphasized in this connection that he was speaking only for the American passenger car industry.

Germany Not in Field

When asked by Senator Reed to explain why no one could make a car in Germany and compete with the United States in the South American market, Mr. Sloan said:

"It is due in the first place, I think, Senator, to management; and in the second place, because Germany has not yet really entered the automobile field. I think

MY opinion is that the proportion of American cars used abroad will decrease. Everything is headed that way.—Alvan Macauley, President of the National Automobile Chamber of Commerce and of the Packard Motor Car Company.

In addition to testifying before the subcommittee on metals of the Senate Finance Committee concerning the automotive phase of the Hawley Tariff Bill, Mr. Macauley read a prepared statement, a summary of which said:

"A canvass of most of the passenger car manufacturers of the country indicates their willingness to try out a 10 per cent ad valorem duty if coupled with the same countervailing duty which is now provided. With respect to heavy duty trucks and buses and electric motor trucks the situation is basically different. Theirs is not a mass production industry to the same extent and consequently they have not the same advantages in competition."

the base materials are as favorable to manufacture in Germany as they are here; and, labor, as you know, is a great deal less; yet I believe the manufacturers are dependent upon sources of supply materials and components that do not make them independent. Hardly any of them, no matter how big they are, make absolutely everything themselves. Therefore, the manufacturer would not be dependent upon his own position in the industry, but he would be dependent upon the general position or attitude of mind of other manufacturers toward the problem. They have not progressed as far as we have. For instance, iron castings in Germany cost twice what they do here. There is no reason why they should, because the base that they start from is not very much different, and labor is not very much of a factor in a thing of that kind, but, nevertheless, the cost is twice as large as it is here. Of course, that will change with development and intensity of operation."

Domestic Market Limited

"Mr. Sloan, as long as the standard of living in Europe remains as low as it is, is it not fairly evident that they will never have the same wide domestic market that we have?" asked Senator Reed.

"They are not going to," replied Mr. Sloan.

Mr. Sloan added later that he thought we were "going to see a much denser automobile population in those countries than we have."

"Will not the increased domestic desire for a car automatically improve the condition of the people in those countries?" asked Senator Alben W. Barkley, Democrat, of Kentucky, a member of the subcommittee.

"On that point, Senator," replied Mr. Sloan, "it is interesting to note the interest the French people take in the French salon, which is the French automobile show. It is more heavily patronized even than ours is, and it costs 10 francs admission, which is a lot of money for the average French person, and yet there is that much interest."

Questioned by Senator Reed concerning the countervailing clause in the tariff bill, Mr. Sloan said:

"If it remains in, I would say that it would be, of course, naturally, an additional protection to our industry here, because I cannot conceive how any of the manufacturing countries abroad could reduce their duty to benefit by that because I think they have got to keep their duties high enough to protect their industries."

French Cannot Cut Duty

Mr. Sloan said he thought France, which has a duty of 45 per cent on automobiles, could not afford to reduce it.

"I think that it needs that protection for its industry," Mr. Sloan stated, "and I think it has got to have that industry, as I stated before."

Senator Barkley asserted that any reduction of the duty in our tariff probably would not bring about any reciprocal action on the part of any of the European countries.

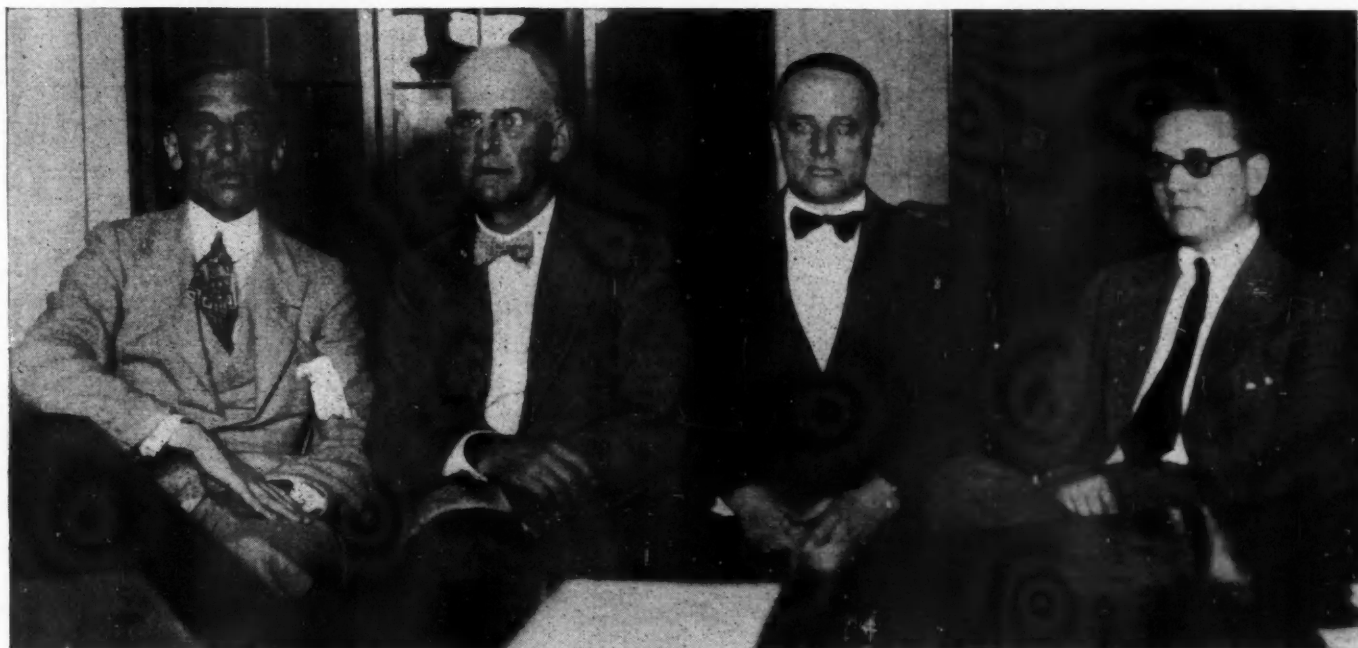
"As we see things today," said Mr. Sloan, "I think your statement is right." Mr. Sloan added later that it would make no difference under present conditions whether the countervailing duty was left on, reduced or taken off altogether.

He said he was not prepared to say what the situation relative to that clause would be later when "things get going in countries like Germany, where you have materials comparable with ours, where you have labor that is one-third as costly as ours, where you have labor that is just as efficient as ours—when they take up the serious production of motor cars, I do not know what the answer is going to be."

Mr. Sloan said he would not state there would not be any serious competition from abroad within the next five years, but he added that he was proceeding upon the assumption that there was no basis for fear in that connection.

Necessity for retaining the countervailing clause was

Executives Who Testified at Tariff Hearing



Executives who testified at Washington before the sub-committee on metals of the Senate Finance Committee relative to the automotive phase of the Hawley Tariff Bill. In the group, from left to right, are Alfred P. Sloan, Jr., president of the General Motors Corp.; Alvan Macauley, president of the National Automobile Chamber of Commerce and president of the Packard Motor Car Co.; Walter C. White, president of the White Motor Co., and R. I. Roberge, assistant manager of sales of the Ford Motor Co.

stressed by Mr. Macauley, who declared that "In the absence of it, I do not see any reason why they could not do a fine job of dumping over here."

If the duty were reduced to 10 per cent and the countervailing duty clause omitted, Mr. Macauley said he thought that "whenever they had some surplus cars left on their hands that they could not move readily over there, they would bring them over here."

"Mr. Macauley, confidentially, now—if we may talk confidentially—there is not the slightest basis for any apprehension of any invasion of our market for an indefinite period of time by the producers of automobiles in Europe, is there?" asked Senator William H. King, Democrat, of Utah, a member of the subcommittee.

"I could not agree with that at all, Senator," declared Mr. Macauley. "I think

there is not a danger today, but those people on the other side are just about as smart as we are. They can buy anything we can buy. They can get any talent we have. The only thing they do not have, that I know anything about, that we have, is a home market of very large proportions. They can substitute a world market for that in the course of time; and I, on the contrary, expect a very vigorous competition."

"That would be a good thing, probably," remarked Senator King.

"In view of this situation, Mr. Macauley," continued Senator King later, "do you not believe that even if cars are not put on the free list that it would be good policy, it would be what I might denominate a handsome gesture, to our friends across the seas and in Canada and South America, for us to reduce the tariff upon this item?"

"You asked my opinion," replied Mr. Macauley. "I think it would be a very futile gesture. France, England, Germany, and the other countries over there are going to look at the records. They have just the same records we have and if we are making a gesture affecting 75 or 80 cars a year, I do not think it is going to be far reaching."

"I do not think it is very much of a gesture to reduce the tariff on something that does not come in and at the same time put the tariff up on something that does come in," commented Senator Barkley.

"That is about it," said Mr. Macauley.

Asked by Senator Couzens as to whether he expected the number of American cars to increase or decrease in those manufacturing countries where American manufacturers market from 10 to 15 per cent of the cars used, Mr. Macauley said:

"I can give this only as my own opinion. My opinion is that the proportion of American cars used abroad will decrease. Everything is headed that way."

"In other words," said Senator Couzens, "as the in-

dustry increases and improves and gets a wider market in the manufacturing countries of Europe, they will supply more of their own needs and our sales will decrease rather than increase."

"In my opinion, undoubtedly," asserted Mr. Macauley.

"Every year for the past few years we have been hearing that the point of saturation had been reached in America in the consumption of automobiles," said Senator Barkley. "Is there any such point in sight yet?"

"It is hard to say," answered Mr. Macauley. "Certainly we are still selling them."

One witness at the hearing said that his company advocated free trade as far as it was concerned. He was R. I. Roberge, assistant manager of sales of the Ford Motor Co., who said he was representing Edsel Ford, president of the Ford Motor Co.

"You have heard the questions that we have asked these other witnesses," said Senator Reed, addressing Mr. Roberge. "I would like to have your ideas and those of your organization on what ought properly to be done on paragraph 369."

"Mr. Ford has expressed himself as being in favor of free trade as far as the Ford Motor Co. is concerned," said Mr. Roberge.

"He would put this on the free list entirely, then, would he?" asked Senator Reed.

"Yes, sir," answered Mr. Roberge.

"Without any countervailing duty?" queried Senator Reed.

"Yes, sir," answered Mr. Roberge. "He has not expressed himself as regards the countervailing duty. He has merely said he was in favor of free trade as far as the Ford industry is concerned."

Mr. Roberge agreed to ask Edsel Ford to write Senator Reed a letter stating his attitude on the countervailing duty clause, and to ask Henry Ford to write the Senator concerning his views on the automotive tariff and the countervailing duty clause. Efforts made

by *Automotive Industries* to obtain a statement from Henry Ford on the subject of the automotive tariff and the countervailing duty clause were unavailing.

Appearing for the truck industry, Walter C. White, president of the White Motor Co., submitted a statement which Senator Reed ordered to be spread upon the record of the hear-

ing following the testimony of Mr. White, in which the latter said by way of a summary:

"The motor truck industry is not a mass production industry. It is a specialty business. Continuance of the present 25 per cent ad valorem duty together with countervailing duties is essential to its continued prosperity."

In explaining his contention upon the witness stand, Mr. White said:

THE motor truck industry is not a mass production industry. It is a specialty business," said Walter C. White, President of the White Motor Company, in testifying before the subcommittee. "Continuance of the present 25 per cent ad valorem duty together with countervailing duties is essential to its continued prosperity."

MR. FORD has expressed himself as being in favor of free trade as far as the Ford Motor Company is concerned." — R. I. Roberge, Assistant Manager of Sales of the Ford Motor Company, who said he was speaking for Edsel Ford, President of the Ford Motor Company.

"There is no such thing in the truck business and the bus business today as mass production. We have to build our job to meet the requirements of the user. By that I mean, the man that is hauling dirt has one type of truck. The man that is delivering lumber, for instance, has a different body and a different chassis; and the same thing is true of the truck that is used by the telephone company, or the truck that is used for van work, or the bus chassis that is used. The heavy duty truck business today is a custom business."

"Is it impossible to standardize it?" asked Senator Reed.

Truck Types Differ

"We have found it absolutely so," replied Mr. White. "There is such a great variety, not only in the bodies that are required for the different things, but the mechanical equipment that goes on them. We are building winch trucks; we are building six-wheel trucks; we are building four-wheel trucks; we are building trucks with single tires and trucks with dual tires; we are putting post-hole-diggers on them, and accommodating them to all kinds of business. That means special work, special requirements. Mass production of those things simply is out of the question. The market is not big enough; and most of the companies that are using those things have their own engineers who have their own ideas, and if we want to sell them we have either got to talk them out of their ideas or else meet them."

Mr. White explained that mass production is employed in the making of Ford and Chevrolet trucks, as well as similar small commercial vehicles. He said he would differentiate between the light, mass-production vehicles and the heavy duty trucks on the price basis, classifying

those costing more than \$1,000 in the latter category and those costing less in the former.

Members of the subcommittee spoke of the possibility of classifying the small, mass-production trucks with passenger cars in the tariff bill and placing a 10 per cent duty on them and retaining the countervailing duty clause, while keeping the same duty as at present on the heavy vehicles; namely, 25 per cent with the countervailing clause.

"There is not a truck company that is making any money to speak of," Mr. White said, maintaining that "if you let foreign competition in, too, you will help kill them off." He said that now American truck manufacturers have to meet foreign competition in bidding on large orders, especially those from outside the United States.

Buses were classified by Mr. White as being in the same category as heavy trucks.

Re-import Revision

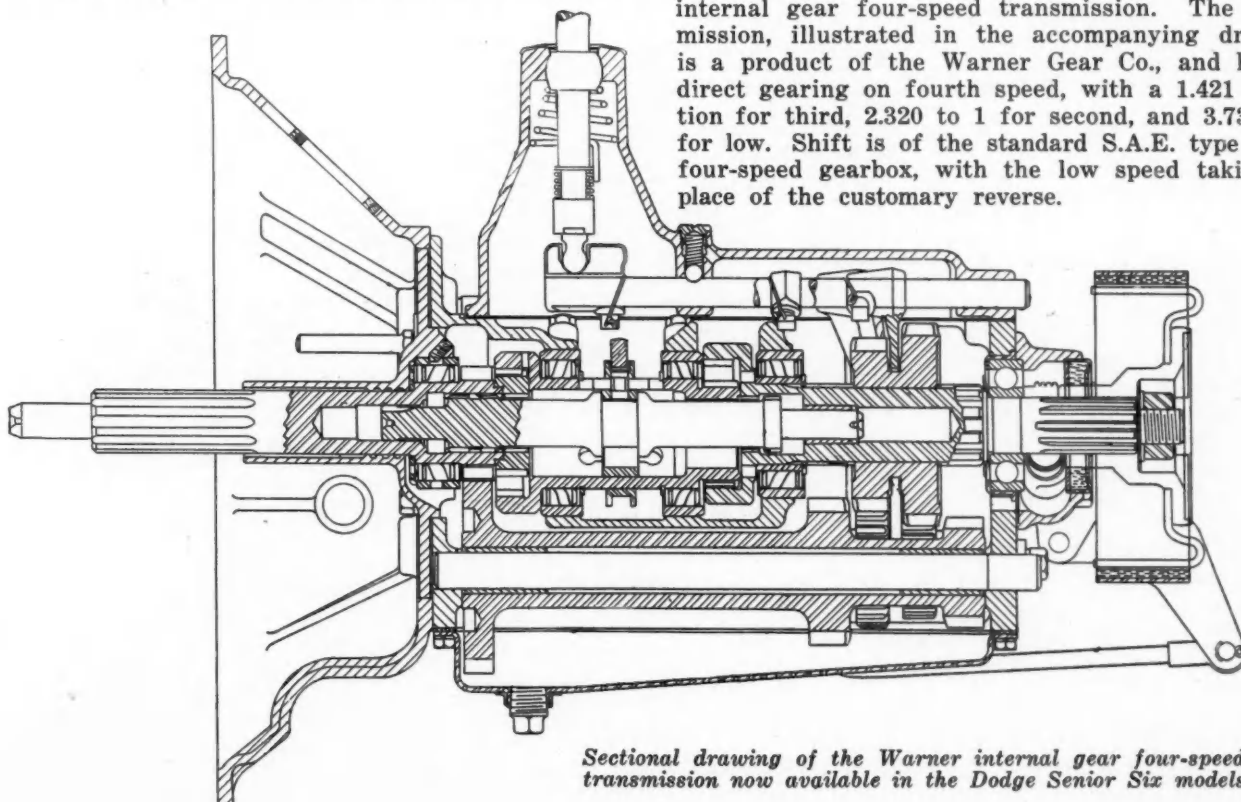
H. H. Rice, Chairman of the Legislative Committee of the National Automobile Chamber of Commerce, asked the subcommittee to revise the tariff bill so that no duty will have to be paid on American cars, made in America and sold abroad, if they are returned to the United States.

"At the present time," said Mr. Rice, "a car made here and purchased by an American abroad cannot be brought back into this country without paying the full duty which may be imposed on any foreign car, because of paragraph 1514 of the free list, which permits an article to be reimported if imported by or for the account of the person who exported it, which, of course, would not be the individual purchaser."

Dodge Senior Six Transmission

ANNOUNCEMENT was made in *Automotive Industries* last week that the Dodge Brothers Division

of the Chrysler Corporation's Dodge Senior Six is available with either the standard three-speed or an internal gear four-speed transmission. The transmission, illustrated in the accompanying drawing, is a product of the Warner Gear Co., and has its direct gearing on fourth speed, with a 1.421 reduction for third, 2.320 to 1 for second, and 3.738 to 1 for low. Shift is of the standard S.A.E. type in the four-speed gearbox, with the low speed taking the place of the customary reverse.



Sectional drawing of the Warner internal gear four-speed transmission now available in the Dodge Senior Six models

Buick *Steel-Backed* Main Bearings *Produced by Pressing Method*

Development of machining operation for ductile steel of low carbon content has accomplished the necessary reduction in manufacturing costs.

By ATHEL F. DENHAM

ONE of the most interesting developments in the 1929 cars, especially from a production angle, were the steel-backed interchangeable main bearings first introduced by the Buick Motor Com-

pany. While the idea of a steel-backed bearing in itself is not new, many arguments have been put forward against its use in the past, all of which seem to have been overcome by the Buick design and production method, as evidenced by exceptional freedom from bearing service troubles during the past year and the adoption of this feature of the new Marquette.

pany. While the idea of a steel-backed bearing in itself is not new, many arguments have been put forward against its use in the past, all of which seem to have been overcome by the Buick design and production method, as evidenced by exceptional freedom from bearing service troubles during the past year and the adoption of this feature of the new Marquette.

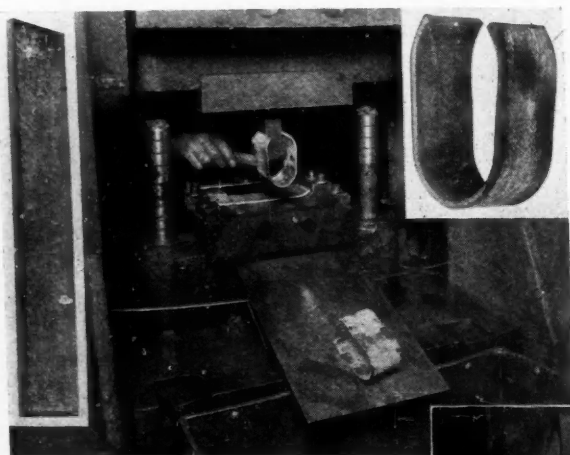
Principal among the advantages of the steel-backed main bearing shell are:

First, its greater stiffness; second, the better bond said to be obtainable, and third, a lower material cost.

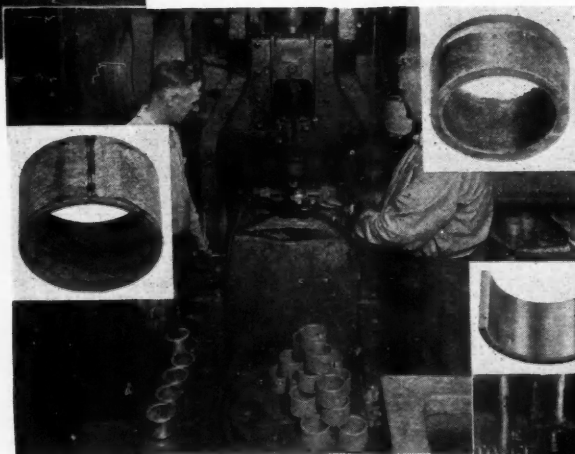
The modulus of elasticity of low carbon steel is approximately twice that of bronze, and thus the

thickness of the shell can be reduced materially, while still maintaining greater back stiffness, thereby reducing the tendency of the babbitt to pound out. Arguments advanced against the use of steel for main bearing shells included its lower heat conductivity, but they were chiefly directed at the high production cost if produced by the same methods as bronze-backed bearings.

True enough, the heat conductivity of steel is somewhat less than that of bronze, but when it is considered that crankpin bearings in connecting rods always have been virtually steel-backed bearings, with in many cases higher bearing loads than those encountered with main bearings, especially in radial aircraft engines, the argument of too low a heat conductivity does not appear to be decisive. Moreover, the proof of the pudding is in the eating, and the Buick bearings have indicated no trouble due to overheating.

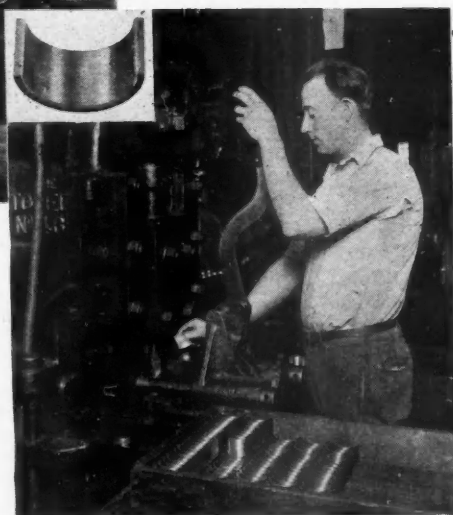


Figs. 1, 2 and 3—Above is shown the first pressing operation on the Buick steel-backed main bearing. At the left is the strip steel as fed into this press. In the upper right corner is the U-shaped bearing shell after this operation

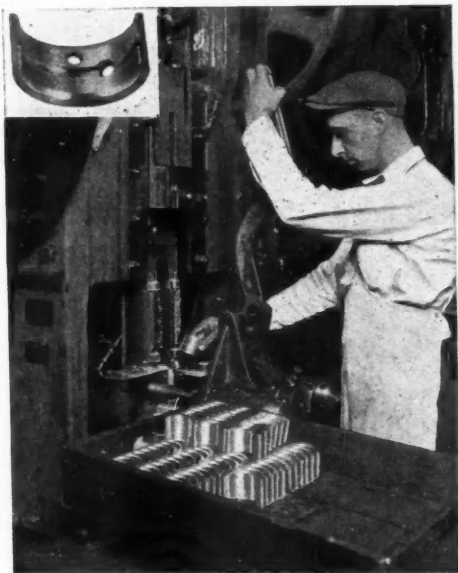


Figs. 4, 5 and 6 (left)—Babbitting of bearings is performed before splitting, in a special die cast machine after sandblasting and tinning. At the left is shown the cylindrical bearing shell before sandblasting; at the right is the babbitted bearing

Figs. 7 and 8 (right)—View of the final swaging operation, in which the practically finished bearing shell half is brought to final size. The insert shows the bearing half, after splitting and before swaging



Part of the answer might possibly be found in the heat reduction resultant from a fairly large lubricant flow through the bearings. Part of the answer may be in the thinner shell thickness used, and part in the fact that it is the crankcase immediately back of the bearing, and the lower bearing cap, which may be the controlling factors as to final temperatures reached.



Figs. 9 and 10—This vertical broach for the contact faces of the main bearings, as may be noted, is primarily a standard press with herringbone cutters. In the insert is shown the finished bearing half, ready for line reaming after mounting in the crankcase

the high cost, relatively, of such tubing compared with that of sheet steel.

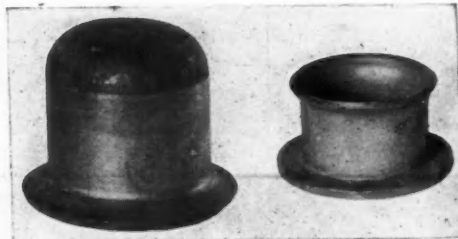
It became evident, then, that before costs could be lowered, a new production method would have to be developed. The possible reduction in shell thickness with steel over that of bronze finally opened the way by making it possible to press the shells instead of casting them. A ductile steel of low carbon content, which could be bent into a cylindrical form, was needed, and found in the S.A.E. 1020 steel. With this as a start, the production method now in use at Buick was developed.

Sheet steel for all Buick main bearings is bought in strips of 3/16 in. thickness, and a width slightly larger than the circumference of the plain bearing. While the basic production principles are the same for all bearings, their application to the plain and flanged type thrust bearing shells differ widely.

Taking first the plain bearing, the sheet steel is cut into strips as shown in Fig. 1, on a standard toggle press, these strips being slightly wider than the main

A really serious problem was found, however, in the production end. Even a steel with the best machineability is not comparable with bronze on a production cost basis. If similar methods are used, the higher machining cost with the steel far more than offsetting the lower material cost. Moreover, the use of steel tubing also has been found unsatisfactory, due to

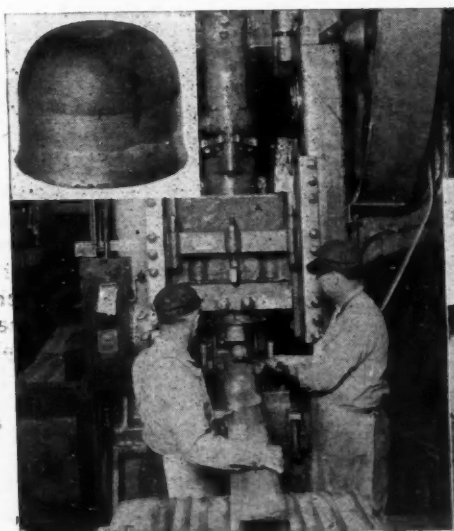
Figs. 13 and 14—After annealing the cup it is redrawn and annealed, and the lower flange turned, as shown at the left, Fig. 13. At the right is shown the bearing with the closed end cut off and the second flange half formed



bearing width and somewhat longer than the circumference of the final bearing. The next operation consists of bending these strips into cylindrical form. This is accomplished in two operations, the first, shown in Fig. 2, consisting of bending the strip into a rough U-shape, as shown in Fig. 3, and the second completing the cylindrical forming operation. In the latter, the dies are so designed that the ends are first butted, so as to place them under initial compression, after which the sides of the bearing shell cylinder are pressed outward, the dies at the same time pressing down on the butted ends, a swaging blow completing the operation. After this operation the shell appears as in Fig. 4.

By using this method of pressing, there is no tendency of the butted ends to spring apart on removing the cylinders from the dies, the butted ends being so close that in the die-casting operation there is practically no tendency for the babbitt to find a way out through the crack, as may be noted in Fig. 6.

The cylinders as formed in the press operations are, of course, somewhat larger than the final bearing shell diameter requires. This is necessarily so, since the bearing must later be sawed in two and provision must be made for the metal removed by the saws. Following the forming operation, the cylinders are sandblasted to clean them, and also to roughen them to provide a mechanical, in addition to a chemical bond for the die-casting, which follows this operation and is performed in the usual manner after pickling and tinning, (Fig. 5.)



Figs. 15 and 16 (right)—After finish forming, the second flange trimming, and sandblasting, the shell appears as in the upper left. The outside diameter of this bearing between the flanges, as shown above, is finished on a centerless grinder

Figs. 11 and 12 (left)—The first operation on the flanged main bearing consists of blanking and drawing a cup out of 3/16 in. low carbon strip steel. At the upper left is shown the resulting product



After boring and facing the cylindrical shell, it is rough-turned on a lathe, only a light cut being required. The outside diameter is then finished on a centerless grinder. Up to the next operation, that of splitting, the outside diameter of the bearing cylinder is still

per and lower halves, which also take the crankcase thrust. In this case the sheet steel is not cut into strips, but is coated directly with drawing compound, the first press operation blanking and drawing the metal into a cup shape. This operation is shown in Fig. 11, with the bearing cup shown in Fig. 12.

The bearing cups are then annealed and pickled, whereupon they are redrawn in a second press operation. In this operation, a third draw and a sizing operation, all on presses, the bearing is reduced to a cylindrical form with a flange on the open end, as shown in Fig. 13.

After a second annealing, the closed end of the cup is cut off on a standard lathe, leaving the end open for the forming of the second flange. The latter is accomplished in two forming press operations, the first turning the flange up to an angle of 45 deg., as shown in Fig. 14, and the second finish-forming the flange. After turning the outside diameter of the flanges, and sandblasting to prepare the shell for babbitting, the latter appears as in Fig. 15. Die-casting is performed in a machine special as to design, but the process does not differ in principle from that used for bronze-backed bearings or that used for the plain bearings discussed in the first part of this article.

After babbitting, the inside diameter is rough-bored and the flange straddle-faced, the first on a screw machine and the second on a lathe. The outside diameter of the bearing shell proper is then turned and the inside diameter chamfered.

The finish grinding operation of the outside diameter between the flanges is performed, as shown in Fig. 16, on a centerless grinder, after which the bearing is ready for sawing in two.

The sawing operation is performed (as in the case of the plain bearing) on a double-spindle hand miller with opposed feed, shown in Fig. 17. An upsetting operation follows the sawing to reduce the bearing to nearly its final size, but in the case of the flanged bearing, an additional preliminary operation is required, that of bending the bearing half in a compressed-air-operated bench fixture. This process gives assurance that the final swaging operation (shown in Fig. 18) which is performed on an air-operated press in the same manner as on the plain bearing, will leave the shell half in a set condition as far as the metal is concerned. Otherwise, due to the mass and elasticity of the flanges, the bearing might have a tendency to spring back slightly in some cases, depending on the grain structure.

Broaching of the parting line is done also on a press equipped with herringbone vertically mounted flat broaching blades as in the case of the plain bearing, following which the flanges are finish-faced to length and width in a lathe operation. After machining the radius (on a miller) drilling the oil hole, milling the oil groove, etc., the bearing half, as illustrated in Fig. 19, is ready for assembly into the crankcase and line-reaming.



Fig. 17 (left)—Splitting of the flange bearing is facilitated by the use of a double spindle opposed feed hand miller, with relatively high spindle speeds



Figs. 18 and 19 (right)—The final swaging of the bearing half is preceded by a bench operation in which the ends of the bearing are bent in to facilitate the final swaging. At the lower right is shown the finished main bearing before assembly into the engine and line-reaming

oversize, about .046 in. The splitting of the shell itself is accomplished on a two-spindle opposed feed hand miller, the shell then appearing as in Fig. 7.

Bearing halves are now ready for sizing to final shape, and to accomplish this the shell half is swaged in special dies on a combination hand and compressed air operated press, shown in Fig. 8, leaving the shell half about .014 to .018 in. oversize in circumference. This not only leaves material for the subsequent broaching operation, shown in Fig. 9, of the parting line in a press fitted with a vertical broaching cutter instead of dies, but also leaves the radius .002 in. oversize so that the bearing half when assembled into the crankcase will be under molecular tension, thus assuring a good seat for the shell in the case. It is interesting to note that it has been found possible to hold the shells to .0001 in. tolerance as to final radius in production.

Ends of the bearing shells are now chamfered, and the radius is put on a hand miller. After drilling the oil hole and milling the oil groove—which is semi-annular in the case of the Buick and annular in the case of the Marquette—the shell, as shown in Fig. 10, is ready for assembly into the engine. Finishing of the inside diameter of the bearings is by line reaming after assembly into the crankcase, about .010 in. thickness of babbitt being left in the shell for the final reaming operation.

While the general principles underlying the manufacture of the Buick steel-backed main bearings are given in the foregoing description and the application of these principles to the plain-type bearing illustrated, a somewhat different method is used in producing the flanged main bearing rear center up-

Efficient Combustion in Oil Engines Is Controlled by Five Factors

To secure maximum performance, the compression ratio should be large enough to insure prompt ignition without danger from high explosion pressures.

By WILLIAM F. JOACHIM

Sr. Mech. Engr., Westinghouse Electric & Mfg. Co., Machine Works

THE design of the high-speed oil engine combustion chamber requires considerable persistent analysis in order to insure the proper coordination of its shape with the distribution and relative movements of fuel sprays and combustion air. To secure maximum combustion performance at high speeds, the compression ratio should be sufficiently high to insure prompt ignition without danger from high explosion pressures. The ratio of mean cylinder wall area to mean cylinder volume should be a minimum. The arrangement of valves or ports should induce a specific type of induction air turbulence. The piston should cause considerable additional air turbulence at top center and the whole mass of combustion air should be reached directly by the penetration of the fuel spray.

Fig. 4 shows schematic drawings of four fuel pumps used on high-speed oil engines. Each pump employs a different principle for fuel injection.

Fig. 4a shows the Westinghouse eccentric driven plunger, rail-car engine fuel pump. The timing of injection on this pump is controlled by advancing or retarding the pump shaft by means of a governor-controlled splined coupling. The amount of fuel injected per cycle is controlled by rotating the pump plunger by means of a crosshead which is rotated in turn by a manually-operated or governor-controlled rod engaging spur gear teeth on the crosshead. The rotation of the plunger by-passes the fuel earlier or later in accordance with the position of the spiral by-pass cut below the plunger head. The pump injection cycle takes place when the plunger is moving at its highest velocity.

Fig. 4b shows the arrangement of the Cummins cam-driven, pump-injection valve unit. Injection timing is controlled by advancing or retarding the camshaft, while the amount of fuel to be injected is controlled by a metering needle in the atomizer. This cam-controlled injection unit is unique, as it provides for admission of the fuel to the atomizer during the engine suction stroke and its aeration and partial preheating

during the compression stroke. Accelerated injection of the fuel and air take place under relatively low pressures through several small orifices.

A third type of cam pump, as used on the Dorner engine, is shown in Fig. 4c. Injection timing may be controlled by rotation of an eccentric shaft carrying the cam lever, and the amount of fuel injected by varying the stroke of the plunger. The pump injection cycle starts when the plunger covers the inlet port and ends with the end of the plunger stroke. The fuel is injected by hydraulic pressure at an accelerated rate.

Fig. 4d shows a new type Westinghouse cam pump. Injection timing is controlled by advancing or retarding the camshaft and adjusting the beginning of the plunger stroke. The fuel is injected at an accelerated rate and is controlled in quantity by the spiral by-pass cut below the plunger head.

The functions of the oil engine fuel pump are to provide correct injection timing and force the fuel through the atomizer orifices under such hydraulic pressures and at such rates as will permit the desired coordination of the injected oil particles and combustion air.

As yet, little is generally known about the various hydraulic phenomena existing in injection systems. Their effects in injection pipe pressure waves, and on hydraulic impact and pressure in atomizers alter the pump-pressure-cycle and therefore the resultant rates of fuel injection. The detail design of the fuel pump is of considerable importance, therefore, in the proper control of these phenomena.

Fig. 5 shows schematic drawings of four hydraulic pressure atomizers used in high-speed oil engines. Each atomizer operates on a different principle.

Fig. 5a shows the type of atomizer now in use on

Westinghouse oil engines. Atomization of the fuel is obtained with this atomizer by the use of several relatively small orifices and moderate or relatively high injection pressures. Fuel distribution is controlled by use of the correct size, number, and radial and angular arrangement of the orifices. The start, cut-off,

THE accompanying article constitutes the second part of the paper read by Mr. Joachim at the Penn State Oil Power Conference and A. S. M. E. Gas Power Meeting, held at State College, Pa., from June 24 to 27, 1929. The first part was published in AUTOMOTIVE INDUSTRIES of July 13.

and many characteristics of the injection process are controlled in conjunction with the fuel pump by the loading of the atomizer spring. This general type of atomizer has few parts, is readily adjusted, and is more widely used than any other type for fuel injection from the center of the cylinder head.

Fig. 5b shows the Acro-Bosch atomizer. Fuel atomization and distribution are controlled simultaneously in this type of atomizer by the diameter and width of the annular orifice, and the injection pressures employed. A well atomized oil spray is produced by this design.

A third general type of atomizer, the Junkers slotted orifice atomizer, is shown in Fig. 5c. Atomization and distribution are both controlled, as in the previous annular orifice atomizer, by the shape and size of the slot and the injection pressures employed. The fuel jet is usually "fish tail" in shape and thickness, but may be varied in all its atomization and fuel distribution characteristics by the injection pressures employed and the design of the slot and adjacent atomizer fuel passages. Injection start and cut-off are controlled by the fuel pump.

Functions of Atomizers

A fourth general type, the variable area, annular orifice atomizer, used by Dorner and Packard, is shown in Fig. 5d. Atomization and distribution of the fuel is controlled by the diameter and angle of the seats, the manner and force with which the stem is held to its seat, and by the fuel delivery of the pump. The quality of atomization and distribution of the fuel throughout the injection process varies more with this type of atomizer than with other types, as controlled by the outwardly opening stem and the resultant varying orifice area. The fuel is thus highly atomized at the start and end of injection and is coarser in between in accordance with the existing orifice area, and the fuel pressure and delivery rate. Spray penetration and distribution vary in a similar manner, their control being effected by the forces operating and the detail design of the seats.

The functions of the high-speed oil engine atomizer

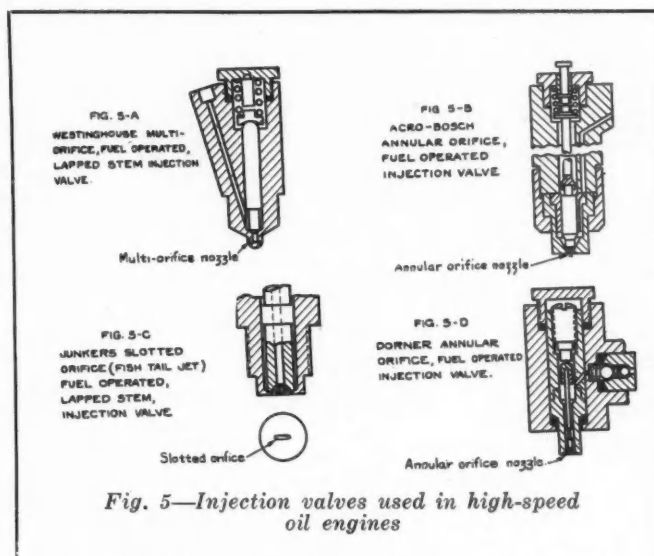


Fig. 5—Injection valves used in high-speed oil engines

are to thoroughly and efficiently atomize the fuel and project it, in conjunction with the action of the fuel pump, into all parts of the combustion chamber. The combustion obtained in high-speed oil engines is particularly dependent upon correctly timed and thorough distribution of the atomized oil particles throughout the combustion chamber. This distribution must be progressive and so regulated as to produce an intimate (carbureted) mixture of the fuel and combustion air at such rates, taking into consideration the several successive oil particle heating, vaporization, ignition, and combustion time lags, as will insure the required combustion rates and therefore the maximum cylinder pressure and indicator card desired.

Fuel Factors

The carefully designed oil engine is relatively insensitive to the kind of fuel used in it as compared with the exacting fuel requirements of the present-day carburetor engine. There are, however, a number of fuel oil characteristics that must be taken into consideration when designing for high combustion efficiency. These consist chiefly of their spraying characteristics, vapor pressures, ignition temperatures, ignition time lags, and combustion reactions.

Fig. 6 shows the results obtained on spray penetration, spray cone angle and spray distribution when different fuels are injected into air at 80 deg. Fahr. and 200 lb. per sq. in. pressure. The data were obtained with the N.A.C.A. spray photography equipment employing a 0.022 in. orifice and 8000 lb. per sq. in. injection pressure. It may be noted that gasoline, kerosene, light Diesel oil, and a heavy fuel oil were all tested under the same conditions, the data being plotted against the specific gravity of the fuels.

Considerable variations in all three spray characteristics were obtained for the complete range of specific gravities, i.e., 0.70 to 0.90. For high-speed oil engines, however, this range may be restricted to specific gravities from 0.85 to

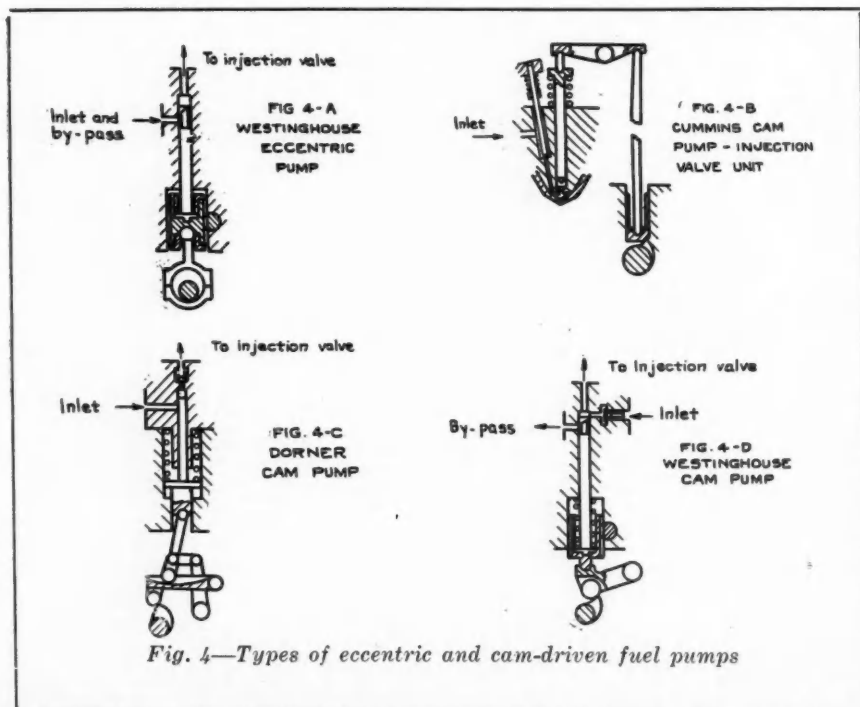


Fig. 4—Types of eccentric and cam-driven fuel pumps

0.90, when it is found that the penetration increase was 6 per cent, the spray cone angle decrease was over 10 per cent, and the spray distribution decrease was only about 2 per cent. Thus, while the total spray distribution in a particular combustion chamber would be decreased approximately only 2 per cent by a change from the light fuel oil to the heavier one, the penetration and cone angle would be sufficiently altered to appreciably affect the manner of fuel and air mixing, the efficiency of the fit of such sprays to the combustion chamber, and, therefore, the combustion.

Vapor Pressures

The vapor pressures of fuels exert pronounced effects on the rate of vapor formation from fuel sprays in oil engines. Other physical factors, particularly the coefficient of thermal conductivity, specific heats, surface tensions, and latent heats of vaporization influence the atomization, heat transfer, and vaporization of the fuel during the spraying process, but the magnitude of the vapor pressures are determined by the kinetic energies of the fuel molecules. When the combustion air temperatures are high, these energies are considerably increased, exceed the temperature-lowered forces of cohesion and surface tension, and cause the molecules to break through the surface of the oil particle to produce fuel vapor. Other factors being equal, the vapor pressure of a fuel is a measure, therefore, of molecular activity and rate of oil particle vaporization in the engine cylinder. These factors influence the rates of possible fuel and air mixture formation and, therefore, the dependent rate of combustion in oil engines.

Certain possible physical and chemical limitations of fuels, which might limit the maximum rates of vaporization and combustion in high-speed oil engines have been suggested, but there are no evidences at hand to indicate that such limitations exist. The theory of kinetic energy and many tests, in which these reactions have been as rapid as might be desired, clearly indicate that the rates of vaporization for a liquid fuel depend almost entirely on its vapor pressure characteristics and on the rate of heat transfer to the oil particle, while the rates of combustion depend on the existing absolute temperatures and the rate with which the vaporized fuel molecules are mixed with the oxygen required for

that considerable differences exist in the vapor pressures of oil engine fuels and that they do not increase rapidly until temperatures between 700°F. and 800°F., have been reached. For temperatures above 800°F., the vapor pressures of all fuels increase very rapidly so

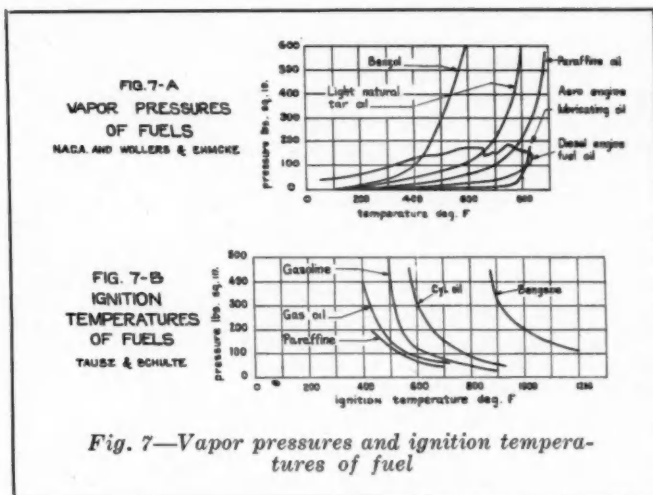


Fig. 7—Vapor pressures and ignition temperatures of fuel

that vaporization in this range, though influenced by the effects of other previously mentioned factors, may be expected to proceed vigorously. These temperatures are indicative of the minimum air temperatures to be tolerated at the start of injection and, therefore, of the compression ratios to be used in high-speed oil engines.

Fig. 7b gives the lowest temperatures of auto ignition of various fuels for a considerable range of air pressures as determined by Tausz and Schulte in their tests on fuel sprayed in heated compressed air. These data are useful in determining the lowest temperatures and their corresponding air pressures, and thus the minimum compression ratios, at which ignition may be obtained in low-speed oil engines. For high-speed oil engines, they have a somewhat different and more valuable application since much higher pressures and temperatures are already required to force sufficient vaporization and heating of the fuel vapors to permit ignition in the brief time available.

Ignition Lag

The available ignition lag data for oil engine fuels are given for various air pressures, temperatures, and turbulence in Figs. 8a, b, c, and in papers by K. J. E. Hesselmen, and Tausz and Schulte. These data are relatively meagre and inapplicable, however, for use in high-speed engines because the determinations involve instrument errors affecting their high-speed application and because they were made in slow-speed engines or in pressure chambers which did not sufficiently simulate the conditions existing in engines operating at high speed.

The order of the ignition lag in high-speed oil engines is from 0.002 second to 0.001 second at the start of injection. After combustion has started, assuming that it is actively initiated during injection, the ignition lag is decreased due to the much higher temperatures and local volumes of high density air existing in the cylinder. This decrease in ignition lag time, during the course of injection and the closely following combustion, is considerably influenced by the physical constants of the fuel itself, the rate of atomization and distribution of the fuel spray, and whether or not the oil particles are projected through actual flame or only through adiabatically, combustion-compressed, high temperature

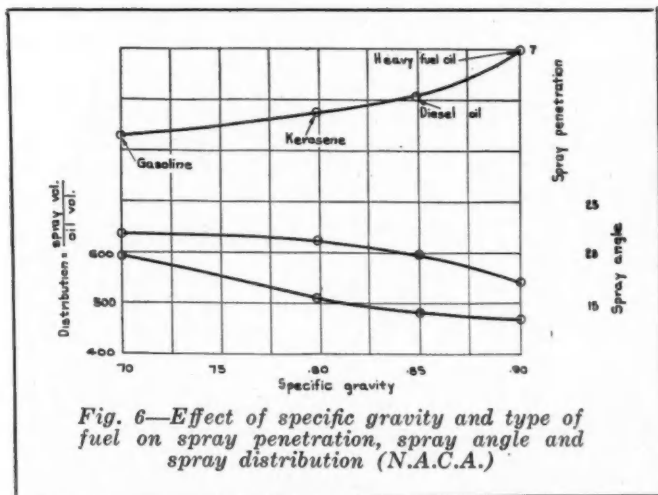


Fig. 6—Effect of specific gravity and type of fuel on spray penetration, spray angle and spray distribution (N.A.C.A.)

their combustion. These factors are physical conditions that are capable of being controlled by proper design.

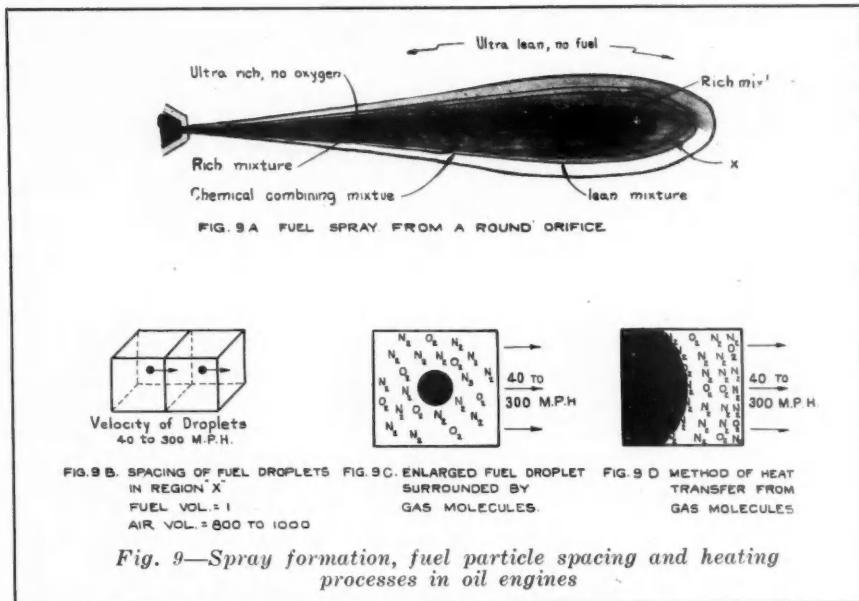
Fig. 7a shows the vapor pressures of several fuels obtained from tests conducted at the N.A.C.A. and in Germany by Wollers and Ehmecke. It may be noted

air. Analyses of the atomization process at the atomizer nozzle, the growth and development of fuel sprays, and the relative combustion air densities and temperatures existing during injection, indicate that the ignition lag near the end of injection may vary from 0.001 second to a minimum of about 0.0005 second for the various design-controlled possibilities mentioned.

The combustion reactions of oil engine fuels are complicated. Each fuel is not in itself a pure liquid, but consists of a combination of different fuels whose molecules are of different sizes and contain different numbers and arrangements of carbon and hydrogen atoms. The different types of molecules have widely varying degrees of stability and break up into two or more molecules upon the application of heat with difficulty or with ease, depending chiefly on the molecular structure. Thus, the fuel injected into an engine cylinder first undergoes atomization as controlled by mechanical design, fuel characteristics, thermal factors, hydraulic factors, and aerodynamic factors; second, the relatively cool, atomized oil particles are progressively vaporized by the high temperature air in the cylinder or by actual flame; third, several different kinds of molecules with varying characteristics are thus formed; fourth, these various molecules break up on being heated into still other molecules, and fifth, these new molecules immediately undergo combustion reactions which in themselves are complicated.

It has been ascertained by chemical authorities that the complex molecules of oil fuels break up on being heated to form, principally ethylene (C_2H_4), methane (CH_4), and some acetylene (C_2H_2) though small amounts of ethane and formaldehyde are also produced in the range of temperatures between 650°F. and 750°F.

Combustion reactions in oil engines, according to various authorities and experiment, occur at such velocities when the fuel-air mixture density is chemically proportioned as to place no chemical-reaction limitations on present engine speeds. Common examples of similar



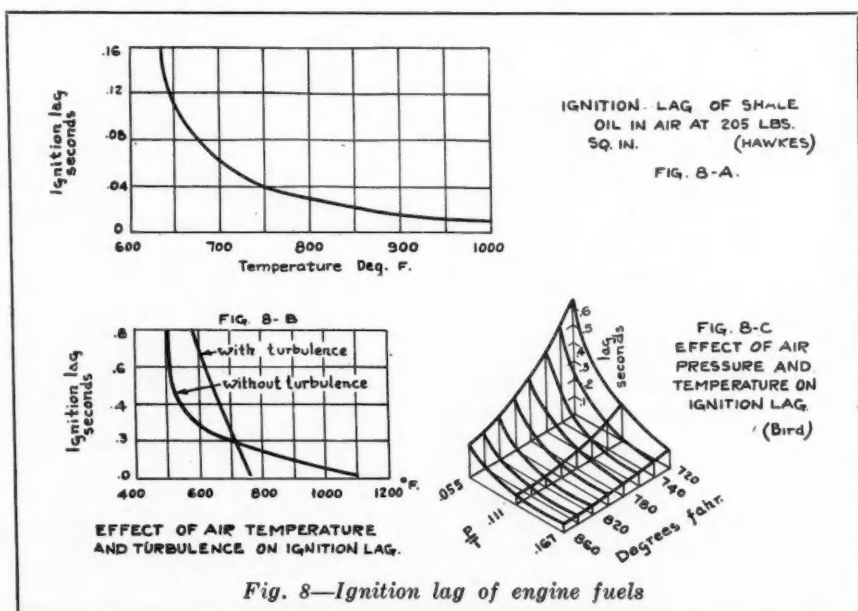
combustion reactions which are in fact the same as those in oil engines except in the first stages are those taking place in aircraft, automobile and racing car engines operating at speeds ranging from 2000 to 8000 r.p.m. The major physical conditions controlling the rates of combustion reactions are the absolute temperatures and pressures of the combustion air, the relative concentrations of fuel and air, and the speed with which these concentrations are produced as controlled by the combustion chamber and injection system designs.

Oil Spray Distribution Factors

The exact distribution of fuel throughout all parts of oil sprays is not known. In fact, oil sprays are produced by so many different design methods and hydraulic pressures that their cross-sectional, oil-particle distributions are probably so non-uniform and varied as to make a complete study of this subject a considerable undertaking. Some knowledge of the distribution of oil particles in fuel sprays is necessary, in spite of this lack of experimental information, in order to progressively improve the combustion processes in high-speed oil engines and so insure their continued success. This knowledge is thus far supplied by analyses of the effects of the design of atomizer parts, hydraulic pressures, and the action of hot compressed air or fuel jets, and by analyses of photographic fuel spray data. In order to simplify the following considerations, a simple form of fuel spray has been chosen for discussion.

Fig 9a shows the general shape and fuel distribution of an oil spray produced by hydraulic pressure injection through a round orifice. It may be noted that a practically solid core of liquid fuel persists for a considerable distance through the spray. The density of the fuel-air mixture outside the core decreases in all directions from closely packed, coarsely atomized oil par-

Ed. Note: Loss of detail in reproduction of photographs prevents illustrating the fuel spray exactly as described by Mr. Joachim.



ticles at the liquid core to relatively widely spaced, finely atomized oil particles at the surface of the spray.

The oil spray core is fed by the oil rushing from the orifice, is "ultra rich," and, there being no oxygen available, it cannot support combustion. The combustion air just beyond the oil spray surface, on the other hand, is "ultra lean" and, there being no fuel available, it cannot support combustion. Between the surface and the core of the spray is a region of such mixture density proportions as to be capable of initiating and supporting combustion. This region, called the chemical combining region or zone of combustion, is probably nearer the spray surface than the core.

Fig. 9b shows an enlarged section of the region "X"

in the chemical combining envelope of the spray of Fig. 9a. Only two oil particles, surrounded by the air required for their combustion, are shown. The relative proportions of fuel and air in this figure are about 1 to 15 by weight and 1 to 850 by volume. They are based on mixture conditions at top center at any point in the chemical combining region for an engine operating with a

compression ratio of 14. The relative spacing between oil particles in this region is at first surprising when one recalls the appearance of oil sprays and endeavors to coordinate the visual impressions with the fact that each side of the cube of air shown is about 10 times the diameter of the fuel particle. We have the physical condition, therefore, of an oil particle, surrounded by a relatively large volume of hot air, traveling at rates from 300 to 40 miles per hour depending on injection conditions and its position in the spray.

Fig. 9c shows one of the oil particles of Fig. 9b further enlarged as surrounded by nitrogen and oxygen molecules. It has not been possible to give even an approximately true picture of the relative fuel-air conditions in this figure as was possible in the volumetric proportions of Fig. 9b.

Molecular Impact

If it be assumed that the oil particle diameter is 0.0004 in., then its weight will be 0.103×10^{-15} lb. This fuel requires about 15 times its weight of air for complete combustion, which is about 1.5×10^{-15} lb. of air. Since there are 9.4×10^{-24} gas molecules in a pound of air, this fuel particle will be surrounded by 14.47×10^9 nitrogen and oxygen molecules. Each gas molecule is also approximately 12×10^{-9} in. in diameter, or only about three one hundred thousandths as large as the fuel particle.

These 15 billion nitrogen and oxygen molecules are within a radius of 0.002 in. of the (0.0004 in.) oil particle under consideration. Due to the high velocity

of the oil particle through the cylinder, and to the high molecular activity of these gas molecules, millions of impacts on the oil particle take place as indicated in Fig. 9d. These molecular impacts decrease the velocity of the oil particle and result in increases in its temperature due, chiefly, to the loss of total energy by the gas molecules.

These temperature rises, which are probably largely localized at the surface of the oil particle, increase the molecular activities of the oil, as discussed under "Vapor Pressures," and produce fuel vapors that trail behind the oil particle comet-fashion as shown in Fig. 10a. It is obvious that, considering only this one oil particle, the same relatively "ultra rich," chemical combining, and "ultra lean" regions exist in and around the oil particle comet as were indicated for the whole oil spray at Fig. 9a.

Fig. 10b is a very much enlarged section of region "X" in Fig. 10a indicating the relative molecular distribution at the chemical combining envelope of the oil particle comet.

Fig. 10c shows one of the fuel molecules from region "Y" of Fig. 10b as surrounded by the approximate number of nitrogen and oxygen molecules required for its combustion. Assuming an aliphatic hydrocarbon of the saturated $C_n H_{2n+2}$ series, having the composition $C_{10}H_{22}$ we have for chemical combination:

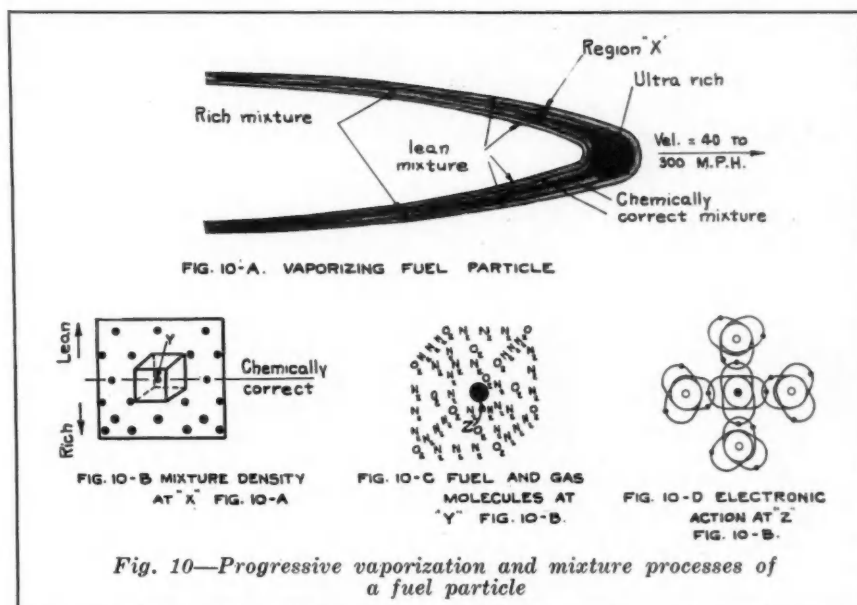


The proportion of gas molecules surrounding the single fuel molecule is, therefore, approximately 16 oxygen molecules and 52 nitrogen molecules.

Combustion Process

Recalling that these heavy aliphatic molecules are ordinarily split up during heating into smaller molecules, particularly into methane and ethylene as discussed under "Chemical Reactions," we may consider the probable processes of actual combustion.

Assuming an ethylene molecule to be formed, amongst others as above, we have for the ethylene molecule, C_2H_4 , or two carbon and four hydrogen atoms. The atom is now generally considered to be the smallest non-divisible unit of matter, the various combinations of which make up the universe. According to electronic theory and practical confirmation by experiment, however, each atom is made up of electrical charges and has its own system of protons and electrons. These atomic systems of protons and electrons bear relations to each other much as does our solar system to other solar systems. Within these atomic systems, the electrons bear relations to the proton much as the planets of our solar system bear to our sun. Theory thus in-



dicates an intricate system of molecular structure within the tiny oil particle, a definite atomic structure and arrangement within each molecule, and a system of electrons revolving in orbits around their protons within each atom.

The Fuel Atom

Fig. 10d indicates a fuel atom, at the center of the figure, with only one of its protons and systems of electrons, pictured for simplicity, as might be surrounded by oxygen atoms also consisting of protons and their systems of electrons. Under the intense temperature and pressure conditions existing in the engine cylinder, the normal electronic activities are probably enormously increased so that such heat is generated at electronic impact, and such inter-lacing of fuel and air electronic orbits takes place that the final conditions are set up for permanent union. Whether this final, permanent union takes place through a series of steps as indicated by chemistry, and whether it may be called a chemical union, a physical union, or merely an electrical union, makes little difference in the efficiency of the combustion process, which, as may now be understood, is not restricted by chemical reaction speeds but depends chiefly on all of the physical space-time distributions of the fuel and air from the beginning of injection to the completion of combustion.

With this analysis of the final processes of combustion as a basis we may now return to a further consideration of combustion in the oil particle comet, in the fuel spray, and in the whole engine cylinder. Fig. 11a shows the oil particle comet with approximate temperatures indicated for the oil particle and various portions of its fuel vapor-air tail. The temperature for the center of the oil particle is indicated as 150°F. to 200°F. since the fuel temperature at injection is ordinarily about equal to that of the cylinder cooling water and practically no heat penetrates by conduction below the oil particle surface in the extremely brief time of exposure.

The rapid, progressive vaporization of the oil particle surface and the almost instantaneous removal of the vapor may also explain a low temperature in the oil particle. Obviously, the temperatures of the oil molecules as they are vaporized range between the flash and boiling points of the fuel. Due to the effects of the relative, high velocity of the dense hot air in aiding further physical atomization, these temperatures may remain at relatively low values.

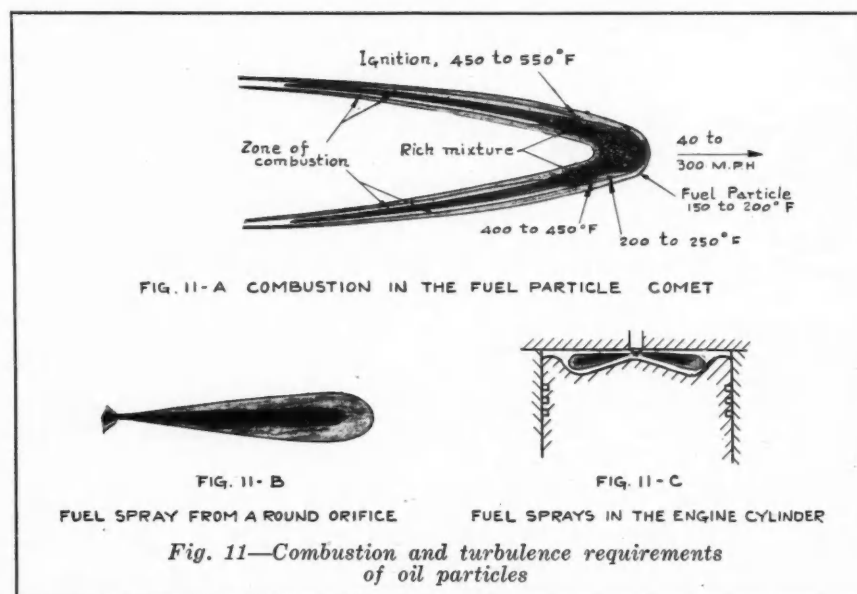
From the point of vaporization, the fuel molecules increase rapidly in temperature, split up into two or more different molecules, and quickly pass through the several stages of chemical transformation, i.e., ignite,

with the evolution of heat in the chemical combining region or zone of combustion of the comet tail. Little combustion probably takes place during this ignition period in the "ultra lean" and "ultra rich" regions of the oil particle comet. In these regions the unfavorable heat transfer conditions slow up incipient combustion by dissipating the heats of the first chemical transformations by direct conduction to the excess air or fuel.

Since there may be two zones of combustion in the tail of the oil particle comet as shown for this analysis in Fig. 11a, one each at the inner and outer chemical combining regions, there will be therefore a central fuel-rich region completely surrounded by flame. While the amount of fuel in this over-rich region is small, the flame walls may be only a few one-hundred-thousandths of an inch apart so that considerable fuel molecule cracking or dissociation rather than combustion may occur. This fuel cracking may result in the formation of undesirable hydrocarbons which are difficult to burn and so result in lowered combustion efficiency and smoky exhaust. It seems evident that a definite amount of combustion air turbulence is required in order to promptly mix these fuel-rich regions with the air required for their complete combustion. This may be called "oil particle comet-air turbulence."

Returning now to the oil spray itself, Fig. 11b, which ordinarily contains enough oil for the case of high-speed engine cylinders to produce from three-hundred-billion to three-thousand-billion oil particles, it should be recalled that there are many millions of these oil particles being formed by progressive atomization. In the chemical combining region of the spray, probably not far

within the spray boundary, there are many other millions of oil particles undergoing vaporization at various rates. Many of these vaporizing oil particles are supporting combustion in their comet-like tails which, for oil particles 0.0004 in. in diameter, may be not longer than 10 to 12 times the particle diameter, or 0.004 to 0.005 in. Recalling that the distance between oil particles of this size in the



chemical combining region, as discussed under Fig. 9b, is approximately 0.004 in., it appears that combustion should proceed without difficulty except for unequal fuel distribution in the comet's tails as previously discussed, and the interference caused by the products of combustion of the preceding oil particles. This last factor and the greatly unbalanced oil-particle distribution throughout the whole oil spray considerably increase the difficulties of obtaining efficient combustion and require considerable additional combustion air turbulence.

This lack of proper fuel and air distribution is probably greatest in the fit to the combustion chamber of

(Continued on page 97)

Just Among Ourselves

Retail Financing Charges May Follow Money Rates

SOME concern has been evidenced among automotive men about the possibility of increased retail financing charges should money rates maintain their present high average over a long period of time. That such a possibility exists is more or less evident on a purely economic basis. Some companies, directly affiliated with motor car concerns, in all probability would be likely to suffer considerable profit losses voluntarily, however, before putting any increases into effect. This in itself would have a strong tendency to hold competitive rates at their present levels.

Even in the case of independent finance companies, moreover, it must be realized that the cost of money is only one of many factors which go to make up the total financing charge. A 5 per cent rise in the cost of money, in other words, would not mean anything like a 5 per cent rise in the financing cost. Our own guess is that slight increases are inevitable if money rates remain high throughout the first half of 1930.

* * *

Hope Springs Eternal —Even In Insurance

WE found one finance company expert last week who was bold enough to predict that insurance rates might come down sometime after the first of next year. We didn't go into the subject with him in any detail, but contented ourselves with looking on the bright side of things for a few minutes. All we can do is hope he is right.

* * *

The Question of Ethics— "Should I Tell My Partner?"

YOU all know the story of the Jewish clothing merchant who presented to his friend a problem in ethics. "A customer bought a \$5 hat," he said, "paid

me the money and started to walk out. Just then I discovered that by mistake he had given me two \$5 bills which were stuck together. Now the problem in ethics is, 'Should I tell my partner?'" Some purchasing problems in the automotive field involve problems in ethics, too. Suppose a parts manufacturer, at the request of a vehicle maker, spends considerable time laying out a design especially for that vehicle maker, submits blueprints of the design and so forth. Has the vehicle maker a moral right to parcel out those designs to competitive parts makers, finally deciding his purchase purely on a price basis? Some vehicle makers obviously do consider such action ethical, as the practice has been indulged in; others, judged from their action also, do not. What do you think about it?

* * *

Little Decisions Made By Millions of Men

WALTER LIPPMANN in his "Preface to Morals" gives an able and typically clear analysis of the causes underlying the relatively befuddled psychology of we moderns. He contributes nothing that is new, so far as we can see, but he presents the known in wonderfully clear and competent manner. The volume is full of things one wants to quote. We'll hold ourselves to just one, which seems to us to apply aptly to the head of a big automotive industrial organization as well as to the government about which Lippmann happened to be talking. The bracketed interpolations are ours.

"The real law," he says, "under which modern society [or modern industry] is administered is neither the accumulated precedents of tradition nor a set of commands originating on high which are imposed like orders in an army on the rank and file below. The real law in the mod-

ern state [or in modern industry] is the multitude of little decisions made daily by millions of men.

"The prime business of government [or of a chief executive], therefore, is not to direct the affairs of the community [or the organization], but to harmonize the direction which the community [or the army of sub-supervisors] gives to its affairs."

* * *

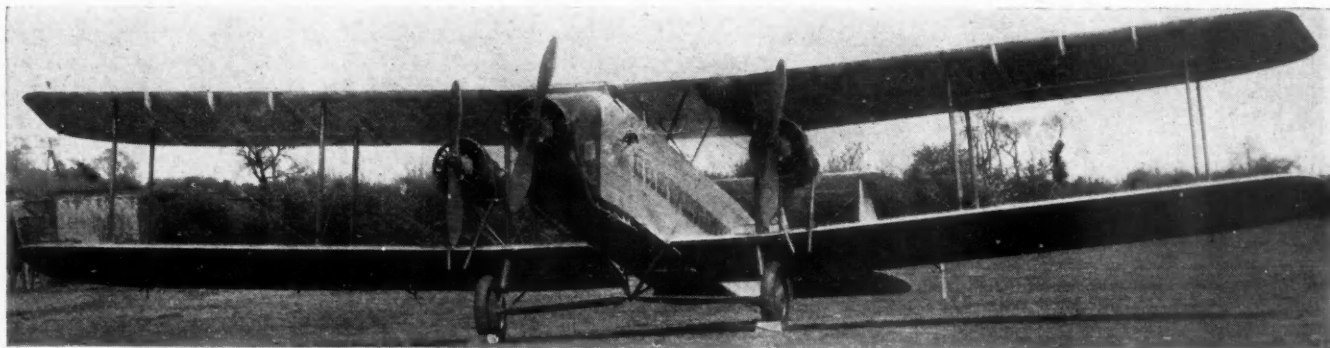
The Executive Harmonizes All Directional Effort

MODERN industry has become too complex to respond healthily and permanently to the will of a dictator. No single human mind is capable of visualizing, ordering and commanding in the way that was possible in the small industries of a hundred years ago. Even if the individuals in an organization would respond adequately to such dictatorship, the very complexities of the business itself tend gradually like parasitic vines to creep up and overwhelm the dictator. The biggest of modern executives, whether they consciously have realized it or not, are devoting a large part of their time to harmonizing the direction given to the business by the thousands of individuals in the organization.

* * *

The College Man's Value Depends on the Industry

THE value of the college man to industry, says E. M. Herr, president, Westinghouse Electric & Mfg. Co., in a current issue of *The Industrial Executive*, depends more on industry than it does on the college man. He says, "An executive is not something you make at college." Mr. Herr ought to know; his organization has had probably longer and more practical experience in utilizing and training college men in industry than any other industrial organization in the country.—N.G.S.



The new Argosy air liner, with three Armstrong-Siddeley Jaguar engines, a fleet of which is operating on the first stage of the new England-India service

Special Craft Fly India Route for British Imperial Airways

Argosy and De Haviland landplanes cover the first and last legs of the flight, while Short Calcutta flying boats cross the Mediterranean from Genoa to Alexandria.

By M. W. BOURDON

THE fleet of air liners, specially prepared for the weekly through service recently inaugurated between London and India by British Imperial Airways, consists of three types of aircraft for use on various stages of the route. Armstrong-Siddeley Jaguar-engined Argosy planes of a new model have been adopted for the European section, Short Calcutta flying boats with British Jupiter engines for the stage that passes over the Mediterranean from Genoa to Alexandria, and the De Haviland Hercules type for the remainder of the route via Bagdad to Karachi. All units of the fleet are three-engined machines.

Particulars of the constructional features of the new Argosies are now available. They seat 20 passengers and at each end of the cabin are compartments for baggage and mail. The planes are capable of taking off with a full load (5000 lb.) after a run of 200 yd., and have a notably short run in landing. With any two of the engines operating they can be flown easily at an altitude of 2000 ft.

With a cruising speed of 95 m.p.h., the fuel consumption is 65 Imperial gallons per hour. The tanks have a capacity of 360 gal., giving an endurance of 5½ hours. The original Argosies in use by Imperial Airways have been operating on the London-Paris service for some three years and experience with them has given rise to a claim that they have proved to have the biggest earning capacity of any

civil aircraft and an unsurpassed record for reliability, safety and low cost of upkeep.

The new Argosy is not an all-metal machine, though steel enters largely into its construction. The cabin frame forming the fuselage is mainly of steel tubing suitably braced, with wood used for the window frames and the members carrying the interior decoration. The forward extension or nose supporting the central engine is also of steel tubing, as are frames for the wing engines and their fairing.

The wing engines are set wider apart than in the earlier model, in order to use the larger airscrews which are justified by the reduction gearing now fitted between the crankshaft and boss of the airscrew. The fairing behind the wing engines is more thoroughly carried out than previously and all three engines are fitted with Townend ring cowlings, encircling the 14 air-cooled cylinders. Each engine is rated at 460-500 hp. and is provided with a new system of exhaust piping which greatly decreases the noise and, in consequence, the comfort of the passengers. Behind each engine is a fireproof bulkhead.

Fuel is carried in two tanks located above and at each side of the cabin and attached to the upper plane. Both are capable of being removed in a few minutes. A sight gage for fuel is provided at the front end of each tank, visible to the pilot and enabling him at a mere glance to learn the volume of



Close-up view of the new servo control operating the ailerons of the Argosy air liner and of one of the wing engines with its Townend ring removed

the contents with a fair degree of accuracy. Each tank has a deep sump which assures the use of the last drop of fuel, whatever the angle of the machine.

A feature of note concerned with the controls is the provision of a small rudder attached to the rear edge of each lower plane. These constitute a servo device

for the lateral control and greatly facilitate the operation of the aileron.

The landing gear with its two wheels has a wider track than hitherto to attain increased stability, shocks being taken by hydraulic buffers acting independently upon each wheel.

Six-Head Rod Rifle Boring Tool

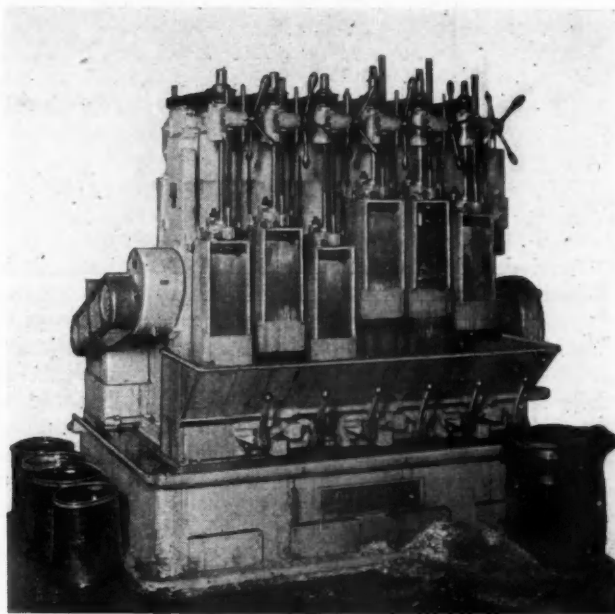
RIFLE drilling of connecting rods for pressure lubrication of piston pins in past years has been associated only with passenger cars in the higher price ranges, with relatively low production schedules.

The introduction of rifle drilled rods, on the Oldsmobile Six this year, brought this feature to cars produced in relatively large numbers and practically necessitated the development of a new rifle boring tool, capable of a higher output per man hour and per square foot of floor space.

After experimenting with a number of different types of new tools, that shown in the accompanying photograph was finally adopted. As the illustration shows, it is a six-spindle machine, and it requires only little more floor space than the more common two-spindle horizontal type. The drills are stationary and mounted just above the oil sump, and the heads, which carry the connecting rods in quick-clamping chucks, are belt-driven individually from inverted electric motors.

The feed for all six spindles is obtained by worm gearing from a single countershaft. This countershaft is belt-driven from the oil-pump shaft, which is coupled to a larger electric motor at the right rear of the tool. The feed for each spindle is engaged magnetically, the magnetic coils being connected in series with the individual drive motors. First a manual engagement is effected by throwing the lever shown in the foreground below each spindle. The magnetic engagement then takes effect. If, during the machining operation, the torque load on the drill increases beyond the safe limit, for any reason, the feed engagement automatically kicks out. The operator then throws the lever over a number of times, until the resistance has been overcome, when the magnetic engagement takes effect once more.

At the end of the cut the head is returned manually. As the box in which the connecting rod is mounted is

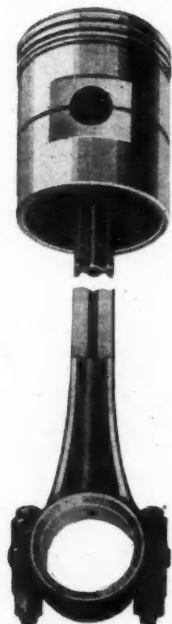


This view shows the method of holding the rod in the fifth spindle; spindles Nos. 4 and 5 are just starting on the machining operation, while No. 3 has just about finished

raised to the top, the clamps holding the rod in place separate, so that the rod can be removed and another installed. This is effected by dropping the front sliding cover on the box by means of the handles shown. Clamping of the rod is also very simple. The driving spindle end has a squared hole, in which the pin end of the rod is placed. The lower free-center holding fixture is provided with two tapered plugs which engage the crankpin-end bolt-holes and firmly press the rod into the upper chuck.

As mentioned, the drill itself is stationary. It is drilled out and cutting oil is forced through the hole under 550 lb. p. sq. in. pressure. The oil returns from the hole being drilled through a groove in the side of the drill. A mechanical by-pass cut out for each spindle is provided, so that the oil flow through the drill stops when the spindle feed is out of engagement. A series of oil sumps and screens below the tool strain the oil for reuse.

The spindle speed is 2500 r.p.m., and the cutting time per rod is approximately six minutes, giving one finished rod per machine every minute.



Cutaway view of rifle drilled connecting rod and piston pin, and (left) piston used in the Oldsmobile Six, showing holes for pressure lubrication. The operation of drilling these parts is described in the accompanying article



Air Brakes on Plane

A NEW giant plane, Model J-38, which is being built by Junkers, will be equipped with air-operated brakes on the landing wheels, according to an item in *Luftfahrt*. The design of these brakes is being carried out in cooperation with the Knorr Company, which has long specialized in air brakes for railways.

Profit Despite Capacity Production Possible by Accurate Control

Problem in the automotive industry is one of adjusting prices to high and low output. Irregularity of demand is the chief obstacle to maximum efficiency.

By W. W. HAY

THE decade just closed (1919-1928) witnessed the advance of the automotive industry to its present position as one of the key industries of this great industrial nation. During this period of 10 short years, manufacturing methods passed through mass production (sic) to what has been so aptly designated as "integrated production." Past events cast their shadow before and sometimes obscure the present, so that while a great deal has been gained for all manufacturing industries, the future of the automotive industry is yet in the balance.

Briefly, the manufacturing phases passed through in the decade may be designated as

- (a) Demand, (c) Satisfaction,
- (b) Production, (e) Merchandising.

Immediately after the World War, automobile manufacturers found themselves with considerable excess capacity, but with the market only needing to be stimulated by the comparatively low prices resulting from mass production. This first phase was comparatively short, as the tremendous demand aroused was insatiable and resulted in a race among producers to keep pace and manufacturing was truly mass production. Old methods, obsolete tools, etc., were rapidly scrapped and the exigencies of production forced new measures and new methods of manufacturing on management. This period plainly ended in the three-year cycle, 1922-1923-1924, definitely during the spring of 1924. During this period, the production of automotive units showed an increase over the previous year during nine successive quarters, and numerous plants were enlarged as though the pace would continue indefinitely.

The apparent collapse of the market in the summer of 1924 was a combination of seasonal decline, cyclical contraction, and of market satisfaction. Dealers were consequently over-stocked, many manufacturers passed out of the picture, and the strongest makers suffered severely.

From this time on the industry has moved definitely

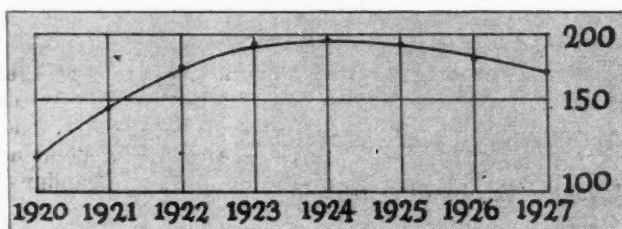


Fig. 1—Graph of three-year moving average showing efficiency ratio (1919 = 100)

on a more stable plane, with periods of expansion in 1925-1926, and again in 1928-1929, interposed by equal periods of contraction such as in 1924 and again in 1927. The years since 1925 have been characterized more by problems of merchandising than of production, with instalment selling, style changes from a few models of one color to many models and more colors than the spectrum—all called upon to maintain production. Meanwhile, a new day has dawned for the automotive industry, grown from a purveyor of luxury to the supplier of the most important necessity of modern transportation.

The great drawback to the production of large quantities of similar units lies in the necessity to maintain a high ratio of production to capacity. That this neces-

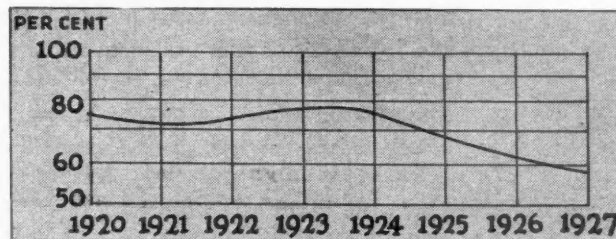


Fig. 2—Per cent of relative capacity production, shown in curve for the years indicated

sity continues in the automotive industry may be demonstrated by a short survey of the industry during the decade in question. Relative capacity to produce has expanded almost twice as fast as production, nor is there any apparent let-up in sight. It is one of the evils of "merchandising," that manufacturing facilities must be ample to meet the success of the moment, since now-a-days the buyer will seldom wait for one car when another is "on the floor" elsewhere. A very large part of the increased ability to produce is the result of increased manufacturing efficiency, gained by more intense use of floor space through rearrangement, by better materials handling methods, salvage, etc.

Invested capital, relative to facilities (capacity to produce) has been reduced during the decade at the rate of about 10 per cent per year and is now almost one-half as great per unit capacity as it was in 1919; and this is perhaps the most marked accomplishment of all.

Nevertheless, it seems time to consider whether further expansion of manufacturing facilities in the face of stabilization of the industry will not result in

reducing the efficiency of the capital employed.

It is axiomatic that the efficiency of labor is a measure of manufacturing efficiency. The efficiency ratio or productive efficiency of employment (Fig. 1)* shows a distinct drop since the period 1923-1924-1925 and while we may look for the cause in many places, it is a function of the ratio of relative capacity to production (Fig. 2). The only comparison of employment reflecting simultaneous and similar changes month-by-month is a comparison of productive efficiency (ratio of true employment to actual production) to the per cent of relative capacity (Fig. 3). That the efficiency ratio does reflect the state of the entire industry is seen by comparison to the index of wholesale prices (Fig. 4) and to the curve of capital invested per unit produced (Fig. 5). This same curve is the nearest measure of the very irregular movement of the line of "Net earnings to net worth." If we accept the evidence of the statistical data presented, then we must accept the continued dependence of the automotive industry on relative capacity production.

The change from mass production to integrated production will not be complete without divorce from the necessity of capacity operation. Rapidity of communication and of transportation have made integration of assembly possible. To realize the full benefits of the new way, production must follow demand and this requires careful and continuous analysis of all markets. Accurate knowledge of demand, present and anticipated, enable accurate control of production. The success of integrated production will require many more changes of methods, both in the shop and in the office. The very irregularity of demand is the chief obstacle to securing maximum efficiency with minimum costs and the present-day problem is one of adjusting prices to high and low production. That prices are merely following the line of least resistance is apparent by again comparing the "Index of

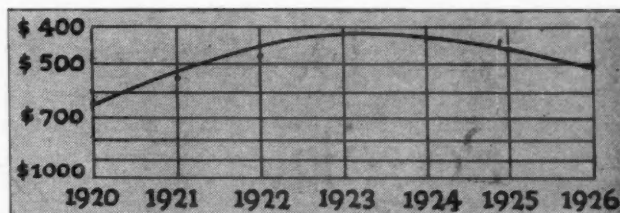


Fig. 5—Three-year moving average—Capital invested per unit produced (inverted)

Wholesale Prices" (Fig. 4) with the aforementioned "Efficiency Ratio" (Fig. 1).

Thus, the issue of the future is thrown back into the manufacturing plant. We must have even more efficient plants; plants which are so flexible in methods that they can operate at low costs on relatively low capacity. The recent abandonment of old plants in favor of more efficient units is possible only with large financial resources and yet many plants are actually obsolete in the light of these newer plants. On the other hand, it is seldom that such older plants cannot by rearrangement conform to the new necessities or be made just as flexible as a new plant, and at the same time be made to produce 25 per cent or more than before.

Utilization of production facilities is fraught with more possibilities than any other recourse of management. We must have more intense use of a greater proportion of floor space for longer hours, brought about by better lighting to bring more floor space into use and by more shifts to reduce the burdens of obsolescence; we must have more effective correlation of this floor space by improved material handling; we must reduce the burden of heat and power requirements by technical skill; and we must give more attention to salvaging the by-products of production.

Coincident with approach to stabilization of any industry is the stabilization of profits. The limiting factor in the growth of individual corporations within the industry is competition among a relatively few very efficient organizations, no one of whom has any marked superiority over any other. There is evidence from the happenings of the past year to indicate that this phase has already been reached in the automotive industry. Immediately profits are stabilized, they should be looked upon as a fixed (capital) charge on the business, and labor should be the variable charge on production. The first reason for the existence of a corporation should be to earn for the benefit of the common stockholders, and many progressive executives now budget their business to earn a definite amount for their common stock. The basis is sound and dependence upon capacity operation is then abandoned.

The establishment of a fixed return on the capital employed requires the display of very

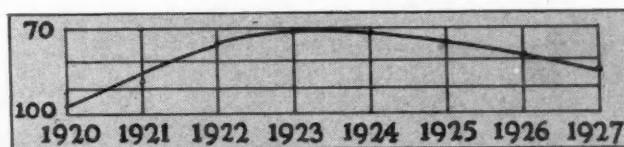


Fig. 4—Three-year moving average. Index of wholesale prices (inverted) as taken from figures of the N.A.C.C. (1919 = 100)

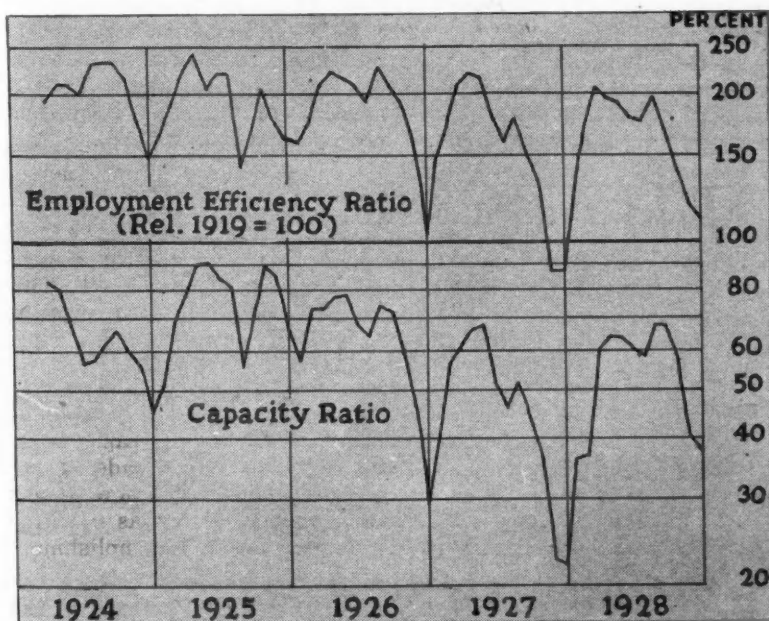


Fig. 3—Graph showing the relation of efficiency to proportion of capacity operation

* Note: Three-year moving averages are used in plotting these curves because they practically eliminate the cyclical influences of general business expansion and contraction.

high class management for its accomplishment. It is contrary to past conceptions of taking the profit from what is left after the costs are deducted from the selling price. It requires the exercise of the science of management rather than the practice of the art of running a business.

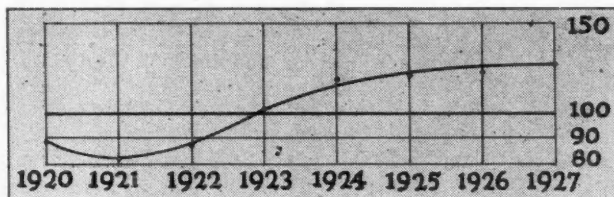


Fig. 6—Three-year moving average—Employment Index (1919 = 100)

Only by planning for growth, forecasting the volume of business, controlling production, and pricing accordingly, can the capital requirements be budgeted upon which a definite return is to be earned. No matter how carefully the plan is made in all its details, there will be those occasional aberrations resulting from human nature and its failures, but the business developed along the lines of a fundamentally sound program will continue to progress, maintaining growth and profits regardless of the inertia of the industry.

Cadillac to Make Amphibion

PRODUCTION of a twin-motored "McCarroll" amphibion is scheduled to begin shortly at Northville, Mich., in a plant purchased by the Cadillac Aircraft Corp. of Detroit, whose formation was officially announced in the issue of June 8, with many well known automotive and aircraft men on both the stockholders' and board of directors' lists.

The ship itself is to be powered with two engines, ranging from 100 to 165 hp., dependent upon the desires of the customer.

In construction the amphibion is composite. The hull has a wood framework covered with a flat dural skin, and provided with five water-tight compartments. The full cantilever wing, which is of high lift section, tapering in both plan and form, is of all-wood construction, having a plywood skin. The large tail surfaces, with the balanced rudder and adjustable stabilizer, are steel tube framework covered with fabric.

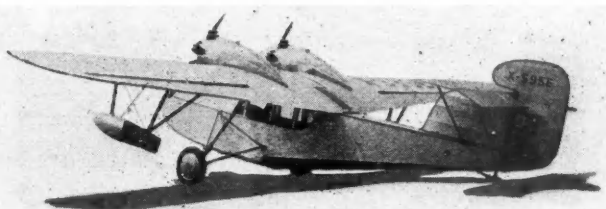
Dual controls are provided, with the crank for the

retractable landing gear located at the center of the cabin roof. Access to the forward part of the hull is through a door in the water-tight bulkhead back of the instrument board and through folding deck doors forward. Engines, which are streamlined by cowling into the leading edge of the wing, are accessible both through this means and through the regular entry door to the cabin in the wing.

Wing tip floats of dural construction are provided for use as a seaplane. The landing gear in the retracted position folds with the wheels against the under wing surface. The main strut for the landing gear passes into the wing. A sliding cover in the lower wing surface moves with the strut to close up the opening in the under wing side. The landing gear has a wide tread and is located well ahead of the center of gravity to give good control as a land plane. Bendix brakes and oleo shock absorbers are standard equipment. The tail skid is steerable.

Fuel tanks are enclosed in the cowling of each motor. These tanks being located back of a fire wall with oil tanks ahead of the fire wall. Cruising radius is approximately 450 miles, with around 80 gal. fuel capacity.

Span of the plane is 46 ft., giving a wing area with ailerons of about 329 sq. ft. Overall length is 31 ft. 3 in. Gross load is 3800 lb. Cruising speed with the Wright 165 hp. engine is estimated at 115 m.p.h., with a top speed of 135 m.p.h., and a landing speed of 50 m.p.h.



The Cadillac "McCarroll Duoplane"

Factory staff of the Cadillac Aircraft Co. includes Reynolds Bacon, production manager, who was associated for 14 years with the Ford and Lincoln Motor Car Companies; A. W. Ackerman, formerly with Stinson Aircraft, as secretary; H. G. McCarroll, formerly with the Detroit Board of Commerce and in charge of Reliability Tours of 1925-26 and the Wilkins North Pole Expedition, as vice-president in charge of management; Ralph R. Johnson, formerly of Paramount Aircraft, as chief engineer, and J. C. Burkman, at present in charge of material and equipment purchases.

New Durant Model Added to Line

A MODEL known as the Durant 6-63 has been added to the Durant line, ranging in price between the 6-60 and the 6-66. It is similar in its mechanical speci-



Durant 6-63 de luxe sedan

cations to the 6-66, but is equipped with a three-speed gear instead of the four-speed gear of the latter. This new model is offered in three body styles, a phaeton listing at \$925; a coupe at \$845, and a four-door sedan at \$895.

Prices on the 6-66 line were slightly raised recently. The coupe was raised from \$895 to \$945, and the sedan from \$975 to \$995, these cars remaining, however, the lowest-priced automobiles on the American market equipped with four-speed transmissions of the internal gear type.

De luxe equipment on the new 6-63, as on the 6-66 lists at \$130 extra. Features of the car are Bendix two-shoe internal brakes, 112-in. wheelbase, and shock absorbers as standard equipment.

THE FORUM

Tolerances in Ball Bearing Press Fits Must Be Varied to Suit Conditions

Editor AUTOMOTIVE INDUSTRIES:

We have studied with careful interest the article in your Feb. 16 issue entitled "Closer Study of Tolerances Would Prolong Bearing Life."

We have been interested because we ourselves have given this subject very careful study, and have recently brought out a complete set of standards, as shown in our new data sheets. We are writing because we believe that certain impressions created by your article are not correct.

First, we should like to bring out the fact that every variation in speed, hardness of shaft or housing, quality of surface finish (whether ground or not), and also speed and load will each in turn affect the desired press fit. Thus, any set of tolerances must be varied to suit each of the above variations and conditions. We can only approximate an ideal for publication.

Next, we should like to point out that it has become the custom among American manufacturers to vary the looseness within the bearing for all applications of any size and set the looseness to fit the requirements of the service and to take care of any press fit that may be used. Thus we, ourselves, use looser bearings when they are employed without locknuts, as shown in the second class of fits in our data sheets.

The third point of interest is that: A great many shops actually use selective assembly. The drawings call for certain variations in fit, but whenever the maximum or minimum arises, they will use another shaft or bearing, or else actually dress the shaft. It is our opinion that in at least one-third of the shops using ball bearings the drawing tolerances are not adhered to on the shaft fits. For this reason only, conclusions drawn from the specified tolerances are erroneous.

THOMAS BARISH,
Assistant Chief Engineer,
Gurney Division, Marlin-Rockwell Corp.

FUEL FOR COMPRESSION-IGNITION ENGINES

Editor AUTOMOTIVE INDUSTRIES:

The *New York Times* for June 21 states that the Standard Oil Co. has under construction at Bayway a plant in which the heavy "ends" are to be converted into "gasoline and other products for which there is a greater demand."

This is in line with information disclosed a few years ago—that procedure with 100 per cent conversion awaited only satisfactory market demands.

It raises the question—of particular interest to many engineers—Is development of automotive compression-

ignition (or C. I.) engines to use fuels having the characteristics of fuel and Diesel oils going to be worth while? (The aeronautic C. I. involves different considerations.)

Unless future export trade is the object now in view in commercializing the C. I. engines, it would seem that the automotive oil engine is not only already an exotic, but is to be decidedly so in future. This is a situation deserving consideration possibly by all those capable of aiding engineers with useful information in this connection.

The C. I. engine is a logical development thermodynamically. But what grade or sort of fuel is this automotive engine of the near future going to run on in America? Perhaps available information or suggestions from the gasoline producers and distributors might be worth an interview.

ROBERTSON MATTHEWS,
Bolton, Ontario.

OBATA ELECTRICAL INDICATOR

Editor AUTOMOTIVE INDUSTRIES:

In *Automotive Industries* of March 23 I read with much interest an article entitled "Instantaneous Pressures May be Measured by Radio," by Norman J. Thompson, of the Associate Factory Mutual Fire Insurance Co.

For a couple of years I have been making various experiments relating to the measurement of pressure, vibration, etc., by radio, and the measurement of the instantaneous pressures was also one of the subjects. The results have been published in several journals, and I am sending you, under separate cover, copies of some of my papers, in which I believe you will be interested.

J. OBATA,
Member of the Aeronautical Research Institute,
Tokyo Imperial University,
Tokyo, Japan.

With his letter Mr. Obata sent us a copy of a pamphlet reprinted from the *Journal of the Optical Society of America* and *Review of Scientific Instruments*, for June, 1928, entitled "The Ultramicrometer, a New Instrument for Measuring Very Small Displacements or Motion, and Its Various Applications," and a copy of a report of the Aeronautical Research Institute, of Tokyo Imperial University, on "An Electrical Indicator for High-Speed Internal Combustion Engines" (Report No. 28, December, 1927). A brief description of the Obata indicator and two illustrations of same were contained in the article on electrical indicators by Prof. De Juhasz in our issue on April 27 last.—Editor.

Boeing Plane Production Methods Emphasize Metal Treatment

Three electric furnaces are used for processing tubes for frames and parts. Fuselage and channel sections are shaped by power drawing operation.

By R. E. JOHNSON

THE most interesting process in the production of parts for Boeing airplanes is the drawing of tubing in the draw bench. This piece of equipment is 42 ft. in length, and, roughly, consists of a heavy endless chain approximately 1 ft. wide, which revolves over large sprockets at the ends of the rectangular metal casing for the chain. On top of the bench is a carriage with a lock grip for the tubing, and a hook attachment which permits connection with the revolving chain.

The round stock tubing to be drawn is annealed in the electric furnaces of the heat treatment department, and then a die plug of the desired shape is attached to a long steel rod and inserted through the tubing, the end of the rod being secured to a stationary clamp at the end of the bench. The other end of the tubing is then locked to the carriage, which is connected with the chain. As the power is applied, the chain revolves at a speed of 15 ft. per min., and draws the tubing over the die plug and the resulting section is shaped by the plug. Square, rectangular or streamlined tubing may be drawn, as well as special channel sections.

When chrome-molybdenum or nickel steel stock is drawn into tubing, it is then transferred to the steel heat treatment department, which adjoins the machine shop. This department, in which all steel parts are processed, is equipped with three electric furnaces, thermodynamically controlled, ranging from 3 to 10 ft. in interior lengths.

If the material is chrome-molybdenum, it is subjected to a maximum temperature of 1625 deg. Fahr., while nickel steel is heated to a maximum of 1500

deg. Fahr. The length of the treatment depends upon the type and gage of the tubing. Following the heating, the tubing is immersed in a cool oil bath for the quenching process, and is then returned to the furnaces for a secondary heat treat at a lower temperature, for the toughening or tempering of the metal. This completes the heat treat process, and the tubing is sent to the inspection booths where government and company inspectors examine the metal for defects.

Dural tubing is treated in the sheet metal heat treatment section where all aluminum and aluminum alloy parts are heated. This department is equipped with three heat solution bath tanks, paired with cold water tanks of corresponding size for the subsequent quenching process. The solution, which is composed of equal parts of potassium and sodium nitrate, is kept at a maximum temperature of 950 deg. Fahr., and is heated by gas and air pipes circulating through the base of the tanks. The treatment varies in duration from 9 to 28 min., depending upon the gage of the metal.

The first step in the assembly of a fuselage is the construction of a steel jig, which is erected on a permanent base of steel. This framework is of steel, and strong clamps are secured to various points. When the jig is completed, it is thoroughly tested for dimensional accuracy before being approved for assembly purposes.

The component tubing parts are then clamped into the jig in their proper assembly places, and bolted together at the joints. Every joint is then electrically welded. The Boeing Airplane Co.'s engineering personnel has developed a welder that



Above is shown a section of the welding and brazing department of the Boeing airplane plant at Seattle, Wash. Boeing engineers have developed a low voltage, low amperage AC welder for use in this operation



View of the welding and brazing department of the Boeing Airplane Co. The large fuselage pictured above is approximately 50 ft. in length and is a contrast to the small structure shown in the foreground, which is 18 ft. 6 in. in length

successfully welds tubing ranging from 0.035 in. to 0.375 in. in thickness. Torch welding and brazing are used to a wide extent in the plant for many purposes, but in fuselage assembly and other structural work, only the electric method is used. Three electric sets are in constant use in the welding department in the welding of the military, mail and transport fuselages.

When the fuselage has been assembled and firmly secured, it is removed from the jig and sprayed thoroughly with oil, by means of a compressed air sprayer of 10 lb. pressure, which forces the oil into all recesses of the structure, and enables the workmen to readily locate any porous welds that might otherwise be unnoticed.

The engine ring, or structural member to which the powerplant of the airplane is attached, is then secured to the front of the fuselage, drilled for bolting, and the surface smoothed with a boss grinder for perfect contact. Following a final inspection by the government and company examiners, the fuselage is pronounced complete and is transferred to the final assembly section.

The tail surfaces, such as the rudder, elevator and other units of the empennage, are constructed much in the same manner as the fuselage, with the structure of small dural or steel tubing being assembled by welding in the welding department.

The largest fuselage constructed at the Boeing plant is the framework for the new 18-passenger trimotored transport being produced at the present time for service on the transcontinental route. The structural unit for this model is 50 ft. in length. The smallest fuselage built by Boeing is the steel skeleton for the single-seater high speed airplane, which is but 18 ft. 6 in. in length.

Landing gears and struts are manufactured in the machine shop on the draw bench, and are sections of streamlined chrome-molybdenum tubing. Wings are produced of either wood or metal, depending upon the type of plane. These members are attached to the fuselage in the final assembly.

The fuselage is covered with fabric treated with a Boeing-developed process and with sheet dural. Cowling is applied to the forward part of the fuselage, and is produced in the sheet metal department from dural or alclad. It is pressed and shaped in a 700-ton hydraulic press.

Exposed steel parts are plated with cadmium to insure them against injury by corrosion. Cadmium was selected by the engineering personnel after much experimentation. A test part plated with cadmium was subjected to 1000 hours in a salt spray bath with no resulting corrosion.

Revise Screw Thread Report

THE new, third report of the National Screw Thread Commission has recently been published. The general arrangement of the previous report (1924)

has been retained, with the exception that specifications for threading tools have been removed from the body of the report, extensively revised, and included as an appendix. Several additions in sizes are made.

New material has been added also to the body of the report as well as to the appendices. Copies of the report can be had from the Superintendent of Documents, U. S. Printing Office, Washington, D. C., at 50 cents each.

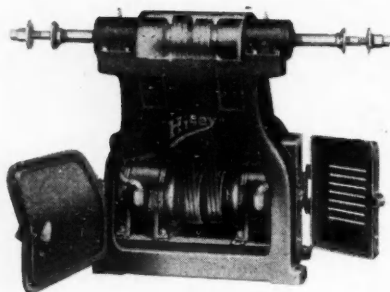


View of the installation which shapes the tubing used in Boeing airplanes. Round stock chrome-molybdenum steel tubing is locked to the carriage on the top of the draw bench, which in turn is attached to the revolving endless chain. The chain draws the tubing over a die plug into the desired shape at the rate of 15 ft. per min.

NEW DEVELOPMENTS—Automotive

Hisey-Wolf Dual Motor Buffer

THE Hisey-Wolf Machine Co., Cincinnati, Ohio, has brought out a new dual-motored Tex Drive buffer with two separate spindles, each operated by its own



*Hisey Tex Drive
buffer and polisher*

motor. Each motor has its own starter and can be started or stopped at will, making it possible to have the two spindles operating at different speeds at the same time.

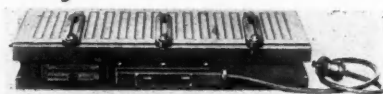
The new machine is of goose-neck design, which gives the operator freedom of movement and permits easy handling of large

and bulky pieces. Accessibility of all parts and rigidity of construction have been carefully considered in the design of the machine. The spindle and bearing housing are assembled as a unit, which may be removed from the base by loosening four bolts on each side. The motor is solidly mounted on a solid cast iron sub-base which is securely bolted to the main frame.

Changing the belt on the new machine is very simple, since the use of the unit head makes it unnecessary to remove the spindle from the bearing housing for this purpose. Automatic lubrication is obtained by a simplified oiling system.

Air Filter for Factories

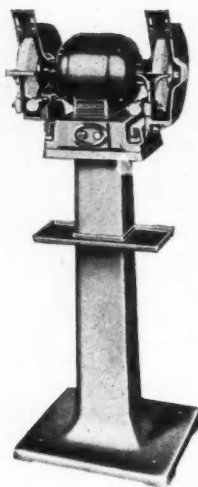
IN plants where wood is being worked, the removal of the fine wood dust that floats through the air is oftentimes a problem. In the Rochester plant of Stromberg-Carlson Co., this difficulty has been remedied by drawing the warm air through air filters located near the ceiling by means of the ventilating system. The system is so designed that it recirculates warm clean air through ducts to various parts of the building in winter. In warm weather, air is taken from the outside of the building and filtered from dust and dirt.



Staynew panel air filter

By supplying clean air in this factory, costly cleaning bills are eliminated and the efficiency of the workmen is increased. Filters are manufactured by the Staynew Filter Corp., Rochester, and are made of felt mounted on rust-proof wire cloth held in steel frames. Thus far it has been necessary to clean these filters about every two months. The time required for cleaning each panel with a vacuum cleaner is but a few seconds, as

the work can be done without removing the filters from the panels.



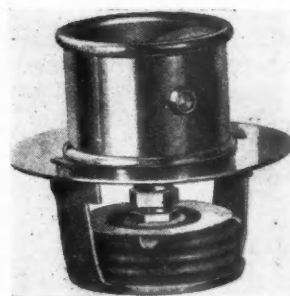
Hill-Curtis Grinders

HILL-CURTIS CO., Kalamazoo, Mich., recently has brought out a new series of electrical grinders built in either bench or pedestal type and with 6 or 8-in. grinding wheels. The motor is enclosed and dust-proof and is fitted with a two-pole quick make-and-break switch. It can be furnished for alternating or direct current use.

*Hill-Curtis pedestal
type electric
grinder*

Bishop & Babcock Motorstat

THE Bishop & Babcock Sales Co., Cleveland, has developed a new automotive thermostat called the Motorstat which is said to possess a number of advantages. It is capable of withstanding high pump pressures and its operation from open to closed position takes place through a short range to provide accurate control. A one-piece valve design eliminates riveting and soldering. Interchangeable flanges make installation easy of different engine blocks.



*Bishop & Babcock
motorstat*

Brown-Lipe Truck Clutches

THE Brown-Lipe Co., Syracuse, N. Y., which has been manufacturing single-plate clutches for motor trucks in 10, 12 and 14-in. sizes, will shortly add a 16-in. size. The feature of this clutch is that the pressure of the single clutch spring is multiplied and transmitted to the pressure plate through a series of steel levers arranged in a circle which take purchase at their outer end against an adjusting ring and press against a circular flange on the pressure plate.

THE General Electric Co., Schenectady, has developed a new relay designed to meet the demand for a multi-finger, alternating current device for general purpose use. It is small, inexpensive and provides a large variety of contact arrangements.

Parts, Accessories and Production Tools

Hill Combustion Chamber

WM. H. HILL, of Canton, Ohio, believes he has solved the high-compression engine problem by the provision of a small initial combustion chamber which is in communication with a secondary chamber in which the mixture is in rotating motion, caused by the compression stroke. This secondary chamber is made in a circular or approximately circular shape, so as to prevent slowing up of the rotary motion by eddies. The communicating passage from the primary chamber is made tangent to this secondary chamber, so that the rotation will be accelerated by the velocity of the burning gas.

To prevent dead ends, this secondary chamber is made in the form of a ring, so the final combustion will take place in the form of a vortex ring, with the primary chamber at the center of the ring. Mr. Hill argues that this will confine the unburnt portion of the charge to the core of the ring, where it will be protected from influence due to the combustion chamber walls, while the surrounding layer of burnt gas will act as a cushion. By properly proportioning the sizes of the two chambers, Mr. Hill believes it will be possible to use compression ratios of eight and even ten.

The idea is illustrated in Fig. 1. While it is particularly applicable to sleeve valve and overhead valve engines, by certain modifications it can be applied also to side valve engines. Mr. Hill has applied for a patent on the scheme.

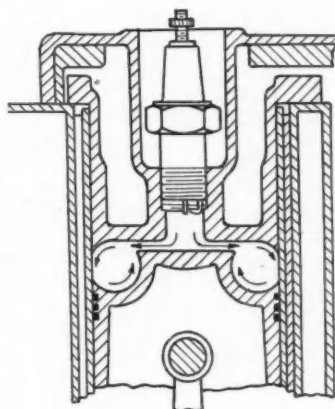


Fig. 1—Diagram of Hill combustion chamber as applied to sleeve valve engine

divisions on the thimble are now available. Micrometer No. 436 may be had with the lock nut feature in which a knurled locking nut contracting a split bushing around the spindle tightens and keeps the spindle central and true or by a slight turn locks it firm, making a solid gage when desired.

The No. 440 Starrett micrometer depth gage can now be furnished with ratchet stop, which permits the same degree of pressure at point of contact in measuring.

RECENT statistics relating to automobile imports into Yugoslavia show that the majority of the vehicles imported the past year came from the United States, the number of American vehicles imported in 1928 being 1204. Italy followed directly after the United States with 267 cars, and France came third with 261. Fourth place was occupied by Germany. Imports from the United States and Germany doubled as compared with 1927, while imports from Italy remained stationary and those from France showed a light gain.

Combustion in Oil Engines

(Continued from page 86)

the one or more oil sprays ordinarily employed in most engines. Analyses of the important space-time, fuel-air distributions, based on many oil spray characteristics and cylinder air movements have been made, so that efficient spray and air mixing characteristics may be obtained in such cylinders as shown in Fig. 11c. This turbulence requirement, ordinarily the only one considered in most designs, may be called combustion chamber-oil spray-air turbulence.

Some of the more important physical and chemical aspects of the combustion problems of the high-speed oil engine have been briefly discussed from the oil spray and oil particle mixture standpoints in this paper. Other aspects of the general combustion problem from the standpoints of detail fuel injection methods, rates of injection, processes of atomization, spray particle mass-distribution, and cylinder design and combustion air movement are also of considerable importance.

In conclusion, it may be stated that, while a near approach to the high thermal efficiencies indicated by theory may not be reached completely at once in high-speed oil engines, rapid advances in the art of combustion control are being made and a successful future for these engines is certain.

Ed. Note—The latter part of Mr. Joachim's paper is somewhat hypothetical, particularly wherein he describes the possible shape and behavior of oil spray particles. We would be interested in receiving, therefore, the comments of our readers and their opinions regarding Mr. Joachim's conceptions and exposition of oil spray action.

Mr. Joachim also included a bibliography covering references to authors mentioned in this and the foregoing part of his paper published last week. Copies of this bibliography are available for those interested in further details relative to oil spray combustion.

Tuthill Pump

TUTHILL PUMP CO., 131 West Sixty-third Street, Chicago, has placed on the market pumping equipment for lubricating, coolant and hydraulic service on machine tools which can be built into the construction of the machine instead of being mounted from a pad or pedestal. All of the important parts of the pumping outfit are supplied and can be applied to most any mechanism with the simplest form of adapter which the manufacturer desires to design.

Micrometer Changes

THE L. S. Starrett Co., Athol, Mass., has made several changes in its line of micrometers. On all micrometers except Nos. 238 and 239 half thousandths

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Reliable,
Accurate

News of the Industry

PAGE 98

VOLUME 61

Philadelphia, Saturday, July 20, 1929

NUMBER 3

Total Production in June is Fixed at 566,744 Units

PHILADELPHIA, July 20—While the production of automobiles has receded from the record-making figures of a few weeks ago, motor car manufacturers report that the demand for new automobiles from all sections of the country continues to exceed the seasonal demand of other years, with the resulting possibility that the industry may manufacture more motor vehicles during July than during the corresponding month of any previous year. Never in the history of the automotive industry has there been such a prolonged peak demand for motor cars as has existed this year.

Official figures from the Department of Commerce fix the total June production of passenger cars and trucks for the United States and Canada at 566,744 units. This is 96,488 units less than the all-time production record of 663,232 reported for April and is 68,784 units less than the 635,528 reported for May. It exceeds the previous high June record established last year by 141,549 units. Total production for the first six months of 1929 is brought to 3,411,451 units, which is 1,084,942 units in excess of the 2,326,509 produced in the same period last year.

When sales mounted to new all-time records during the spring selling season, there was a feeling in some quarters that the buying rush would reflect itself in a sharp decline later in the year. Thus far the predicted decline has been gradual, with no indication of a sharp change for some time to come.

A survey of the country indicates that stocks of new low-priced cars are at a minimum, and in many sections purchasers have to wait for delivery of certain body types. With employment and general business conditions good, indications are that motor car sales will continue in advance of the seasonal experience of some previous years.

United Buys Sikorsky

NEW YORK, July 18—The United Aircraft & Transport Corp. has purchased the Sikorsky Aviation Corp., maker of amphibian airplanes, according to an announcement today by George S. Wheat, vice-president of United Aircraft. The Sikorsky company will continue production at College Point, L. I., until Jan. 1, 1930, when such operations will be transferred to the plant now under construction at Bridgeport, Conn., it was said.

Hardwood Market Shows New Automotive Demand

ATLANTA, July 18—Lumber wholesalers and manufacturers in this market state that there has been a steady improvement in the sale of southern hardwoods to the automobile and body manufacturing industries the past two weeks, with the demand especially brisk from some of the larger factories as they get ready to bring out their new models.

Inquiry for needs during the third quarter and the early part of the fourth quarter is said to be the most favorable in the past two or three months.

While the tendency to buy for current needs or near future wants only is still very much in evidence, lumbermen say that there has also been a tendency on the part of some of the larger manufacturers to place their orders well ahead, as they apparently are expecting an increase in prices. At present the market is holding to a fairly stable basis, though some items used by the automobile and body industries have shown an advance since the early part of July, with the tendency steadily upward.

Delegates to Visit Hoover

WASHINGTON, July 18—President Hoover will receive the United States official delegation to the second Pan-American Congress of Highways at Rio de Janeiro at the White House next Thursday, it was learned this week. The delegates will sail from New York on July 26 aboard the Western World for Rio de Janeiro where the congress will begin its sessions on Aug. 16. J. Walter Drake, Detroit, is chairman of the delegation.

Dept. of Commerce Has New Division

WASHINGTON, July 18—The Department of Commerce this week announced the creation of an aeronautics trade division to aid American manufacturers of aircraft, parts, accessories and allied products in sales abroad. Leighton W. Rogers, formerly American commercial attache at several European capitals, has been placed in charge of the new division.

Negotiations for Merger Are Deferred by Autocar

ARDMORE, PA., July 18—Merger negotiations between the Autocar Co. and the Brockway Motor Truck Co. are still in the discussion stage, and it is probable that no definite action will be taken by either company until next year, according to a high official of the Autocar Co.

The earnings report of the Autocar Co. is in preparation, and until it is completed any further action on the merger is virtually impossible it was said. Completion of the earnings statement for the first half of this year is expected within two weeks.

Uruguay Favors U. S. Cars

WASHINGTON, July 18—American automobiles constituted 93 per cent of the trade in the Uruguayan market during May, according to a report received this week by the Department of Commerce from Consul C. Carrigan at Montevideo. Total number of cars sold and licensed in the city of Montevideo during May was 420, of which all but 27 were of American makes.

Eclipse Estimates Earnings

NEW YORK, July 17—The Eclipse Machine Co., a subsidiary of the Bendix Aviation Corp., will show net earnings for the fiscal year ended June 30 of approximately \$5,000,000, after all charges, it is announced. This includes earnings for the divisions of the corporation in East Orange, N. J., and Walkerville, Ont.

Macauley Predicts Plane Competition

N. A. C. C. President Tells Directors That Costs Are Dropping

CLEVELAND, July 17—Energetic competition between automotive and aeronautic industries will place the light sport plane in direct competition with higher-priced automobiles, according to Alvan Macauley, president of the Packard Motor Car Co. and head of the National Automobile Chamber of Commerce, who attended a directors' meeting of the chamber at the Pepper Pike Country Club here.

Increased production in the aeronautic industry and a steady reduction in operation costs, he said, will result in public benefit in the very near future. Automotive manufacturers are turning to the production of planes and aeronautic accessories, Mr. Macauley pointed out.

Discussing the recent hearing of automobile executives before the Subcommittee of the Senate Finance Committee considering the Hawley Tariff Bill, Mr. Macauley said, "The import of automobiles to this country is almost nothing compared with our exports.

"About 20 per cent of our total production, or 1,000,000 cars, will be exported this year as compared to 700 cars that will be imported. I do not believe a reduction of tariff here will mean a similar move in foreign countries."

Alfred Reeves, general manager of the N.A.C.C., predicted that the annual production of cars for the current year will reach 5,200,000, due partly to increased export.

"Big increases in production of light motor trucks account for some of this advance as well as a tremendous demand and production in the low-priced lines of cars," he said.

"The outlook continues good," he said, "based on continued good business; high purchasing power as result of general employment and with an increasing need of our citizens for individual transportation facilities."

Discussing exports, Mr. Reeves pointed out that foreign shipments of cars increased 47 per cent over the first five months of last year and truck exports showed an increase of more than 132 per cent over the same respective periods.

"Uniform traffic regulation should come with greater rapidity, and we are hoping for rapid advances in accident prevention," he continued.

"There should be some limit on gasoline taxes, which are now much too easy to impose. It is more important, however, that the taxes collected should be used exclusively on the highways and for no other purpose," he said.

Astonishing progress has been made in manufacturing economies, so that the industry is now supplying 735 different models, one maker offering 54

different types with colors as varied as those of Jacob's Coat of Many Colors.

Among the directors present, who were guests of Walter C. White, president of the White Motor Co., were William E. Metzger, president, and M. L. Pulcher, vice-president, of the Federal Truck Co.; H. H. Rice and Alfred H. Swayne, General Motors Corp.; C. W. Nash, president of the Nash Motor Car Co.; Robert C. Graham, president of the Graham-Paige Motor Car Co.; Charles O. Hasting, chairman of the Hupmobile Motor Car Corp.; J. S. Marvin, assistant general manager of N.A.C.C., and R. E. Fulton and E. C. Fink, vice-presidents of the Mack Truck Co.

Deliveries by G.M. Aggregate 194,705

NEW YORK, July 19—General Motors dealers delivered 194,705 cars to consumers during June, according to announcement made today by Alfred P. Sloan, Jr., president. This compares with 206,259 for the corresponding month last year and with 214,870 during May of this year. Deliveries by General Motors divisions to dealers during the month amounted to 200,754 cars as compared with 186,160 in June of last year and with 220,277 in May of this year.

This brings total deliveries to customers during the first half of the year to 1,081,054 cars as compared with 1,062,733 for the corresponding period of last year. Deliveries by divisions to dealers for the six-month period are 1,171,868 as compared with 1,083,316 last year.

Goodyear New Tire Plant is Producing 5000 Daily

ATLANTA, July 18—The new tire plant of the Goodyear Tire & Rubber Co., at Gadsden, Ala., is now in active production, having its formal opening last week with appropriate ceremonies. Construction of the plant was begun slightly more than four months ago, and the present units represent an investment of approximately \$7,500,000, including equipment.

The present capacity is about 5000 tires per day, and by the end of July the company expects to be producing on this basis. It is but the initial unit of an elaborate development the Goodyear company is planning at Gadsden, Ala., within the next few years, including a rubber reclamation plant that is now being established. In all, the development is to cost about \$30,000,000.

Predict 6500 Airplanes

NEW YORK, July 18—Consolidated Instrument Co. of America has completed a survey of the aircraft manufacturing industry, as a result of which it concludes that 52 manufacturers will produce 6500 planes during the year 1929. These figures are based on production estimates of the individual manufacturers.

Added Cost is Seen in I.C.C. Rate Report

Attorney Says \$5,000,000 is Represented in New Schedule

WASHINGTON, July 18—Approximately \$5,000,000 will be added to the cost of transporting automobiles if the scale of rates proposed in the report to the Interstate Commerce Commission in the eastern class rate investigation become effective, according to Luther M. Walther, Chicago attorney for the National Automobile Chamber of Commerce, who argued here today before the commission.

Carriers, however, will not get this added revenue, he said, because manufacturers will move their cars on trucks or on their own wheels. "Drive-away of automobiles and shipment by boats is one of the most perplexing things that carriers in official classification territory have to contend with," Mr. Walther told the commission.

He pointed out that rates in western and southern territories are of the first class, while in the official territory they are 110 per cent of the first class. He said manufacturers are requesting that the rates be made the same in the three territories.

Arguments in the rate change case came to a close today. The hearings began in 1924 with a view of revising all class rates on freight moving in the official classification east of Chicago.

Both shippers and carriers were in accord with the principal findings set forth in the proposed report prepared by Attorney-Examiner Howard Homer, who heard testimony on behalf of the commission. Argument was centered around the more complex provisions of the report.

In the proposed report adjustments in the class rates on iron and steel parts are proposed and the automobile industry, one of the principal users of such parts, was interested in preventing increases in freight rates for the transportation of such parts.

The commission has taken the case under advisement and will probably make an order in the near future affirming or altering the class rates per mile of haulage recommended.

Advertisers to Meet

CINCINNATI, July 17—"Gearing Advertising to Selling" will be the theme of the eighth annual convention of the National Industrial Advertisers Association to be held in Cincinnati Sept. 30, Oct. 1 and 2.

Budd Production Gains

PHILADELPHIA, July 18—The Edward G. Budd Mfg. Co. reports a production of 1,233,323 automobile doors for the first six months of 1929. This compares with the production of 1,317,507 doors during the entire year 1928.

Tire Sales Continue Climb, Report Shows

Production of 8,145,368 Casings is Estimate for May

NEW YORK, July 16—Tire manufacturers in the United States produced a total of 8,145,368 pneumatic casings during the month of May, according to estimates issued by the Rubber Manufacturers Association, based on reports of manufacturers who produce approximately 75 per cent of the total for the country.

Production of inner tubes is estimated at 7,660,172 and total production of solid and cushion tires at 52,815 for the month.

Total shipments during May are estimated as follows:

Pneumatic casings, all classes	7,184,388
Inner tubes	7,037,590
Solid and cushion tires	56,552

Inventories as of May 31, 1929, are estimated as 17,848,580 for all pneumatic casings; 18,927,640 for inner tubes and 178,205 for solid and cushion tires.

The tire industry is estimated to have consumed a total of 88,037,370 lb. of crude rubber and 31,069,490 lb. of cotton fabric during the month of May in the manufacture of all types of pneumatic casings, inner tubes and solid and cushion tires.

The following comparative table, released yesterday, shows inventory, production and shipments as reported by members of the association:

PNEUMATIC CASINGS—ALL TYPES

	Inven- tory	Produc- tion	Ship- ments
April 1929	12,696,808	5,912,854	5,470,779
May 1929	13,386,440	6,109,026	5,388,291
May 1928	9,767,754	5,069,233	4,842,513

INNER TUBES—ALL TYPES

April 1929	13,600,505	5,725,744	5,373,040
May 1929	14,195,731	5,745,129	5,278,193
May 1928	13,276,713	5,375,917	4,724,843

BALLOON CASINGS

April 1929	8,346,727	4,601,986	4,123,769
May 1929	9,047,376	4,732,416	4,022,910
May 1928	5,419,093	3,658,349	3,235,236

BALLOON INNER TUBES

April 1929	8,369,244	4,375,920	3,921,768
May 1929	9,167,038	4,586,606	3,795,350
May 1928	7,055,801	3,695,296	3,011,432

HIGH PRESSURE CORD CASINGS

April 1929	4,292,167	1,305,224	1,335,121
May 1929	4,285,674	1,371,987	1,356,529
May 1928	4,152,775	1,404,097	1,570,710

HIGH PRESSURE INNER TUBES

April, 1929	5,220,167	1,347,128	1,447,504
May 1929	5,017,011	1,155,013	1,480,293
May 1928	6,220,912	1,680,621	1,713,411

S.A.E. Section Plans Opening

DETROIT, July 17—The office of the Detroit Section, Society of Automotive Engineers, which was closed July 15, will be reopened Aug. 5 upon

the return of the assistant secretary, B. L. Brede, from vacation. Activities of the Section will be started Oct. 7, and a number of prominent men in the industry have been scheduled to appear during the first half of the season. Meetings will continue to be held at the Book-Cadillac Hotel.

G.M.C. Quarterly Profit May Reach \$90,000,000

DETROIT, July 16—General Motors Corp. net profit for the quarter ended June 30 is estimated at around \$90,000,000, equal, after preferred dividends, to \$2 a share on 43,500,000 common shares, according to the *Wall Street Journal*. In the second quarter of 1928 net profit was \$91,766,398 or \$2.06 on the basis of present capitalization. First six months net profit should exceed \$150,000,000 or \$3.35 on common against \$161,267,974 or \$3.59 a common share earned in first half 1928, says the *Journal*.

Decline in net profit this year from a year ago occurred in the first quarter of the year when delays incident to the production of new models and consequently higher costs reacted against the normal earning power. Some progress was made in reducing costs during the period notwithstanding the greater values offered in various new lines of cars, but it was not quite sufficient to bring out a new high record in quarterly profits. Business continues very satisfactory and the outlook for the corporation is promising, the *Journal* concludes.

Dr. E. B. Campbell

DETROIT, July 13—Dr. E. B. Campbell, 55, former son-in-law and private secretary of W. C. Durant, died of heart failure July 11 on board the European-bound steamship Majestic.

Dr. Campbell was accompanied by his 19-year-old daughter, Edwina, who planned to meet friends in Paris.

His body will be left at Southampton, and will probably be returned on the Aquitania, which sails from there July 20.

Dr. Campbell was a practicing physician in Flint for a number of years, coming there in the early '90s. He continued his practice until he became associated with Mr. Durant after the latter started the Buick Motor Co.

Thermoid to Build

TRENTON, N. J., July 17—The Thermoid Co. has awarded a contract for a factory addition to cost \$70,000. The building will be 100 by 170 ft. of brick and steel and will be used for the manufacture of automobile brake lining.

Exports to Italy Affected

WASHINGTON, July 18—Proposals to publish a black list of foreign car owners have affected the sales of American cars in Italy, according to a cable from Rome received this week by the Commerce Department.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, July 18—Retail sales of seasonal lines were favorably affected by the warmer temperatures last week. Reports from some sections of the country indicate, however, that collections have been slower. The latest crop reports hold that the cotton crop is in a more favorable condition, while with the grain crops the opposite is the case.

CHAIN STORE SALES

Sales of 25 store chains during June totaled \$122,291,578, as against \$100,192,504 during June, 1928. Sales of the same store chains during the first half of this year totaled \$664,291,242, a new high record, as compared with \$545,721,588 during the corresponding period last year.

FREIGHT CAR LOADINGS

Railway freight loadings for the week ended June 29 totaled 1,095,724 cars, which marks an increase of 92,025 cars over those in the corresponding week last year. Loadings for the first half of this year totaled 25,596,938 cars, which exceeds the best previous corresponding half year on record made in 1927 by 75,898 cars.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended July 13 stood at 98.1, as compared with 98.2 the week before and 97.7 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended July 10 were 7 per cent below those in the corresponding week last year.

STOCK MARKET

The stock market last week was irregular, with no general upward sweep as in the few preceding weeks. Profit-taking sales were well absorbed, however, and some special issues made very substantial gains. The volume of trading was on a large scale. Call money ranged from 7 to 9 per cent.

BROKERS' LOANS

Brokers' loans in New York City for the week ended July 10 declined \$14,000,000, after an aggregate increase of \$480,000,000 during the preceding three weeks.

FEDERAL RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended July 10 showed an increase of \$28,000,000 in holdings of discounted bills, while there were decreases of \$7,900,000 in holdings of bills bought in the open market, of \$5,200,000 in holdings of government securities, and of \$77,300,000 in member bank reserve deposits. The Reserve ratio on July 10 was 73.0 per cent as against 72.9 per cent a week earlier.

Production of Steel Proceeds Favorably

Mills See Greater Activity as
Quiet Season Draws
to Close

NEW YORK, July 18—Steel producers look for a gradual increase in automotive demand with the coming of August. The interval between second-quarter buying and the necessary preparations for more active operations at the plants of automobile manufacturers and parts makers in September is believed to be drawing to a close and to have been bridged without the usually sharp reduction in the employed capacity of steel mills. Manufacturers of low-priced passenger motor cars have been taking a good deal of steel of late, and Ford buying has by no means been the market's sole sustenance.

Shipping orders for hot and cold-rolled strip steel received by mills so far this month are reported to be 25 per cent heavier than during the corresponding period of June, and as strip steel is primarily an automotive material, the movement indicates a fairly wide distribution and is hardly to be ascribed in its entirety to other than automotive consumers.

One of the interesting announcements of the week is the proposed construction of a new mill in the Pittsburgh district for the manufacture of wide sheets of deep drawing quality 66 in. wide. Six double mills are to provide a capacity of 50,000 tons a year. Double mills have heretofore not been used in rolling sheets of such width.

Producers of full-finished automobile sheets continue to operate at a very satisfactory rate. The market is firm, while that for black and blue annealed sheets is holding its own. Non-integrated sheet and strip rollers no longer experience any difficulty in obtaining semi-finished material at second-quarter prices. Automotive alloy steels show no change. The same may be said of bolts and nuts.

Pig Iron—Considerable price shading is reported in foundry iron in the Pittsburgh market, although the Valley market is holding its own in shipments to territory where other districts do not compete. The Michigan quotation is unchanged.

Aluminum—While the market on the whole is quiet, some automotive consumers continue to take foundry metal at a good rate. Stocks of imported metal in bonded warehouses at the beginning of June were in excess of 8,500,000 lb., about twice what they were at the beginning of the preceding month. Prices are entirely unchanged.

Copper—Domestic demand is on the upturn. Producers and "outside" market quotations remain unaltered.

Tin—An advance of $\frac{1}{4}$ cent per pound in the Straits tin market at the opening of the week's trading caused uneasiness among consumers lest formation of the Tin Producers' Association in London and its proposed plans for the "rationalization" of the tin industry bring about, after all, much higher prices. Latest London reports state that the leaders of the movement an-

New Plane Service to Coast Planned

DETROIT, July 17—A new airplane passenger service, which will cut the traveling time between Detroit and the Pacific Coast to 24 hours, has been announced here. The new system will be launched about Oct. 1, linking the Stout Air Service Detroit-Chicago line with a westward line extending from that point, operated by the Boeing Air Transport Co.

nounced that when 100 per cent of the British producers had joined the combine, it would be time enough to consider taking in the producers of Bolivia and the Dutch East Indies.

Lead—Demand is largely for single carloads for filling-in purposes. The market is easy.

Zinc—Unchanged and steady.

Editors Report Business Is Better In First Half

NEW YORK, July 15—Editors of 152 business papers, who answered a questionnaire submitted by the National Conference of Business Paper Editors, indicate that business conditions are generally ahead of those of the first half of 1928 and that the industries they represent are on an even keel.

In spite of high money rates, tariff legislation and labor difficulties, trade is not being hampered and the more than seasonal decline in general business that was anticipated in mid-spring, has not materialized.

Industrial and engineering construction has increased about 30 per cent, enlargement of automotive plants showing a large gain over the same period last year.

Brazil Raises Import Duty

WASHINGTON, July 18—According to a report received by the Department of Commerce this week, the Brazilian Ministry of Finance has stipulated that the 30 per cent highway tax collected on automobiles, tires, gasoline and automobile accessories imported into Brazil shall now be collected on the actual duty, instead of on the nominal duty as heretofore. The actual duty includes the portion, 60 per cent, of the nominal duty converted from gold to paper, at the ratio fixed periodically by the Brazilian Government, of one milreis gold to 4567 milreis paper, it is pointed out.

Instrument Orders Reported

NEW YORK, July 15—The Consolidated Instrument Co. of America, Inc., has received orders from Command-Aire, Inc., and the American Eagle Aircraft Corp. for aircraft instruments amounting to \$63,000, according to an announcement made by Joseph Leopold, president.

Roberge Explains Imports of Tractors

Ford Official Says 90 Units
Have Entered U. S. Since
Recent Ruling

WASHINGTON, D. C., July 17—Importation into the United States of Ford tractors from the Ford factory in Cork, Ireland, began about four to six weeks ago, approximately 90 units having been imported up to July 11, according to a statement made by R. I. Roberge, assistant sales manager of the Ford Motor Co., last week. All of these 90 tractors, Mr. Roberge said, were admitted duty free in accordance with the ruling made by the Treasury Department during the week of June 10.

Mr. Roberge's statement was made as a part of his testimony before the Senate Committee on Finance during a hearing on automotive phases of the Hawley tariff bill. Questioned by Senator David A. Reed of Pennsylvania regarding the relative cost of manufacturing tractors in Cork and in the United States, Mr. Roberge said: "That is very hard to say. We have not been operating in Ireland very long. No cost figures have been prepared on the manufacture in Ireland, but I would say that we think that the cost will be much higher."

Shut-down of the tractor plant in Detroit and establishment of the Irish factory, Mr. Roberge said in answer to further questioning, came about "through necessity in bringing out the new Model A car."

"We were handicapped as to space," he continued, "and consequently were obliged to take over the space in which we manufactured tractors for Model A and for Model T parts. Consequently we discontinued manufacturing tractors here at the same time we discontinued the Model T."

Mr. Roberge disclaimed any knowledge as to whether or not Henry Ford had any thought of reestablishing tractor manufacture in this country.

Senator Reed, having developed the fact that the United States is the largest tractor market in the world, commented that "if this is the biggest market for tractors and if the manufacturing cost and the price are lower here than in the case of Irish-made tractors, one would think that it would be very much to the interests of your company to reestablish that business in this country."

Tractor sales in Russia are very erratic, Mr. Roberge said, in answer to further queries. "We receive large orders and execute them," he said, "and then we do not know what the sales possibilities are until we receive another order." Mr. Roberge stated that it would not be profitable to import British-made Ford passenger cars into the United States even if we had free trade here on automobiles.

Willys Relinquishes Company Presidency

L. A. Miller Takes Place of Toledo Automobile Magnate

TOLEDO, July 16—John North Willys, a dominant figure in the automotive industry since he founded the Willys-Overland Co. 21 years ago, relinquished executive control of the company at a meeting of the board of directors here today, resigning as president to become chairman of the board.

Linwood A. Miller, who joined the company 15 years ago and for the past four years has served the concern as first vice-president, was elected president. Prior to coming with Willys, he had been with the Curtis Publishing Co. and the Pennsylvania Railroad. Mr. Miller was born at Salem, N. J., 44 years ago and is of Quaker ancestry.

Marshall Field and Charles M. Glore, both of Chicago, were elected directors to succeed C. B. Wilson, president of the Wilson Foundry & Machinery Co., Pontiac, Mich., and C. B. Mertz, New York, resigned.

C. O. Miniger, president of the Electric Auto-Lite Co., Toledo, who has been a member of the board and served on the executive committee for several years, was named chairman of that committee. Other members of the committee are Mr. Glore; George M. Jones, Toledo banker, who was a leader in the syndicate which recently purchased most of the Willys holdings in the company; Rathburn Fuller, counsel; Gordon Mather, president of the Mather Spring Co., with L. A. Miller and H. C. Tillotson as alternate members.

Mr. Willys said his contact with the company in the future will be advisory rather than executive.

"My interest in Willys-Overland will always be keen," he said. "I believe we have safeguarded its future with a strengthening of its directorate and I shall serve it in every way possible.

"As chairman of the board I will remain in close contact with the company," he continued. "I am not passing out, but am merely changing my activities. For 21 years I have borne the burdens of this business. Now comes a time when I want greater freedom, and I also regard it essential to my health that I relinquish some of my responsibilities.

"Moreover, I feel warranted in doing this because we have the strongest executive organization in our history," he said.

Recounting the growth of the company from the time it took over the plant of the old Pope-Toledo Co., bicycle manufacturers, to the present plant with its 2000-automobiles-a-day capacity, Mr. Willys said, "Our plant and equipment can be conservatively estimated as being worth \$42,000,000. We have on our books 9596 distributors, dealers and other service stations. Last



Chairman and New President of Willys-Overland

John N. Willys (left), who resigned as president of the Willys-Overland Co. and became chairman of the board this week, and Linwood A. Miller, who was elected chief executive of the company. Mr. Miller joined the company 15 years ago and for the past four years has served as first vice-president

year was the biggest in our history.

"I have great faith in the future possibilities of our export trade," he continued. "Shipment of automobiles now exceeds all our other national export activities. In the first half of 1929 Willys-Overland has broken all export orders for our company with sales in excess of 26,000 cars. I expect to give an increasing amount of attention to this phase of the business because I know it is due for a great expansion," he said.

Among the executives of the company who are said to have shared in the purchase of the Willys holdings are President Miller, who has had general operating charge of the plant for several years; George M. Graham and Colin Campbell, vice-presidents; J. H. Gerkins, vice-president and treasurer; A. B. Qualy, secretary, and W. E. Miner, comptroller.

Plan Tractor Trials

LONDON, July 13—It is reported that the Royal Agricultural Society of England, in conjunction with the Institute of Agricultural Engineering, University of Oxford, will hold a series of agricultural tractor trials during the summer of 1930. Tests will be carried out between June 1 and Sept. 1 and in addition a public demonstration will be given Sept. 16-19. Both the tests and the demonstrations will be made on sites within 20 miles from Oxford. Entry blanks may be obtained from the secretary of the Royal Agricultural Society of England, 16 Bedford Square, London, WC-1. The trials are international in scope.

Hercules to Issue Stock

NEW YORK, July 17—Hercules Motors Corp. will shortly issue an additional block of 150,000 shares of stock for additional financing. This issue will be put out at about \$30 a share.

Willys-Knight Great Six Placed in Production

TOLEDO, July 18—Production of the Willys-Knight Series 66-B, known as the Great Six, has been started and shipments to dealers are now being made, according to an announcement by the Willys-Overland Co. One price, \$1,895, has been fixed for the three body models, the roadster, coupe and sedan. Previously the price for the first two models was \$1,850, while that of the sedan was \$1,995. A number of changes have been made in the specifications since the description of this series appeared in the Jan. 5 issue of *Automotive Industries*.

The rear axle has been changed from a three-quarter floating to a semi-floating type. The brakes have been changed from internal front and external rear to internal all around. A Ross cam-and-lever type steering apparatus is employed instead of the company's own. The wheelbase has been reduced from 126 to 120 in., and the tires, previously announced as 32 by 6.00, is 31 by 6.00. The maximum brake horsepower has been increased from 70 at 3200 to 82 at 3200. An increase in the standard compression ratio from 5.0 to 5.5 has been made. A Rockford clutch is now used, and the Bijur centralized chassis lubrication system has been adopted. The front spring length has been decreased from 41½ to 39 in., while the rear spring length has been reduced from 63½ to 57½ in.

Richards-Oakland Taken Over

DETROIT, July 17—The Oakland Motor Car Co. has taken over the Richards-Oakland Co., of Detroit, world's largest distributor of Oakland and Pontiac automobiles, and henceforth will operate the company as a direct factory branch. H. A. Grubb will be in charge of the branch.

Oakland Selected for Boeing Factory

California Plant Expected to
be First of Several Manu-
facturing Units

OAKLAND, CAL., July 18—The Boeing Airplane Co. has selected this city for the site of its proposed commercial airplane factory, according to Ralph T. Fisher, president of the Oakland Port Commission.

It is expected that location of the plant here will pave the way for other manufacturing units of the United Aircraft & Transport Corp., of which the Boeing concern is a part. Boeing interests have leased a 10-acre plot at the municipal airport.

It is understood that the company will continue its manufacture of military planes at its Seattle plant, confining the Oakland plant to commercial plane production.

Spokesmen for the Boeing concern confined the announcement to the statement that the company plans to use the airport site for a repair depot in line with plans for expanding its continental air mail, passenger and express services, although they admitted that plans have been discussed for building a factory here.

Auburn Earns \$1,312,934 in Quarter May 31

CHICAGO, July 17—Consolidated earnings of the Auburn Automobile Co. for the three months ended May 31 were \$1,312,934 after depreciation, interest, Federal taxes and minority interests, equal to \$8.05 a share on the 163,033 shares of no par capital stock outstanding.

The company in applying for listing its capital stock on the New York Stock Exchange submitted its income account for the three months ended Feb. 29, which showed consolidated earnings of \$526,572 or \$3.23 a share on the present capitalization. This indicates earnings for the first six months of the company's fiscal year of \$1,839,506 or \$11.28 a share. This was the first quarterly statement that the company has published and for this reason no comparison is available.

Detroit Aircraft to Build

NEW YORK, July 18—Detroit Aircraft Corp. has authorized the erection of a seaplane hangar and circle landing field on Grosse Isle, near Detroit. The corporation is asking for bids for the construction of a hangar which will be one of the first of several units to be built at Grosse Isle during the year.

Prest-O-Lite Ends Meeting

INDIANAPOLIS, July 17—The second annual convention of sales representatives of the Prest-O-Lite Storage Battery Sales Corp. came to a close here today with a joint meeting of

salesmen and distributors from every state in the Union. More than 200 attended the three-day session which opened Monday with an address of welcome by H. E. Komitch, sales manager, and an afternoon outing was followed by dinner at the country club.

Erskine Explains Policy on Reduction of Prices

CHICAGO, July 17—In commenting on a report that price-cutting had been started by the Studebaker Corp. in its Dictator Six line, A. R. Erskine, president, stated:

"Past experience has proved, so far as Studebaker is concerned, that sales and profits have closely followed price cuts when reductions were made because economies of operation and in manufacture permitted the company to share these savings with the public. With greater plant efficiency and with assurance of a strong public demand for the Dictator to stimulate increased production, it is only logical that a price readjustment be made to give the public the benefit of economies we have effected." This, Mr. Erskine explained, could in no sense be construed as a price-cutting war.

Husky and B. & S. in Deal

KENOSHA, WIS., July 16—Reciprocal sales arrangements have been made between the Husky Corp., of this city, and Billings & Spencer Co., Hartford, Conn., it was announced today. The arrangement becomes effective Sept. 1 and will enable each concern to offer the trade complete line of socket and open end wrenches and other mechanics hand tools.

Auto-Lite Building

TOLEDO, July 17—The Electric Auto-Lite Co. has announced preliminary plans for a new \$275,000 office building to be built on the opposite side of Champlain street from its present main plant here. The building will be 180 ft. long and 60 ft. in depth.

Pratt & Whitney \$2,000,000 Airplane Engine Plant to be Ready Next Year

HARTFORD, CONN., July 16—The new \$2,000,000 plant of the Pratt & Whitney Aircraft Co., construction of which will start soon in East Hartford, according to officials of the company, will be a complete aeronautical engine manufacturing unit, it has been announced.

It is expected to be finished and in full operation shortly after the first of the year. The entire unit, made necessary by demand for "Wasp" and "Hornet" aircraft engines, will be 400 ft. wide, 1600 ft. long, and will contain 500,000 sq. ft. It will consist of a two-story administration building, a personnel building, an engineering building where experimental work will be carried on, garage, powerhouse and the

Acme Motor Truck Adds 1-Ton Model

New Model 17 Has Six-
Cylinder Engine; Load-
ing Space, 108 in.

CADILLAC, MICH., July 15—Announcement is made by the Acme Motor Truck Co. of the addition of a new one-ton model to its line. This new unit, designated Model 17, is equipped with a six-cylinder Continental engine, four-speed Fuller transmission, bevel-gear Timken rear axle and Lockheed hydraulic brakes.

Designed in one wheelbase length of 136 in., Model 17 provides a loading space of 108 in. With a chassis weight of 3000 lb. and an allowance of 3400 lb. for body and load, the vehicle has a maximum gross weight rating of 6400 lb.

The Continental engine, which is the six-cylinder, 2½ x 4¼ in. Model 29-L, develops 48½ hp. at 2800 r.p.m. It is mounted in unit with a Borg & Beck single plate clutch and a Fuller Model WO four-speed transmission. The Timken rear axle, which is of the full floating type, provides a reduction of 5 5/6 to 1. Standard equipment includes an instrument panel, oil gage, ammeter, electric horn, gasoline filter, speedometer, extra rim, etc.

Wood Adds Hoist

DETROIT, MICH., July 16—The Wood Hydraulic Hoist & Body Co. has added to its line a hand-operated hydraulic hoist for use on a 1-yd. steel dump body. The rated normal capacity of the new unit is 1½ tons, and its maximum capacity 3 tons. While the standard capacity of the body is 1 cu. yd., the front and rear are raised above the top line of the sides, to permit of an increase in the capacity by ¼ or ½ cu. yd., by the addition of sideboards.

main manufacturing unit. Construction will be of brick, concrete and steel.

Sufficient land of 600 acres recently acquired has been set aside, so that the new plant can be increased to five times its original size. The latest Monitor type of factory construction used by General Motors, Ford and other prominent automobile manufacturers will be employed.

A 400-acre airport and flying field will be developed immediately back of the plant after construction is completed.

Production of engines will be increased 50 per cent, and plans are being made so that the present production of more than 200 engines a month can be doubled and tripled.

Men of the Industry and What They Are Doing

Personnel is Announced by LaFrance-Republic

Details of the personnel of the directors and officers of the newly merged LaFrance-Republic Corporation, including its subsidiaries, the LaFrance-Republic Sales Corporation and the Linn Manufacturing Corp., have been completed, and are as follows, states an announcement from the offices of that company:

The directors of the LaFrance-Republic Corp. include: Joseph A. Bower, Charles B. Rose, George R. Hanks, Wallace J. Childs, Frank J. Maginniss, Frank L. Pierce, R. W. Jones, Charles H. Jones, William P. Chapman, Jr., Orley M. Canter.

The officers are: Joseph A. Bower, chairman of the board; Wallace J. Childs, chairman of the executive committee; Charles B. Rose, president; George R. Hanks, vice-president; Frank L. Pierce, vice-president; Orley M. Canter, comptroller; Glenn S. Crisp, secretary; Ralph W. Stork, treasurer.

The officers of the LaFrance-Republic Sales Corp. are: Charles B. Rose, president; F. D. Soper, vice-president; Frank L. Pierce, vice-president; Ralph W. Stork, treasurer; Glenn S. Crisp, secretary.

The officers of the Linn Mfg. Corp. are: Charles B. Rose, chairman; George R. Hanks, president; George Whitman, vice-president; Orley M. Canter, secretary; H. D. Mills, treasurer.

Evans Heads Ryan Aircraft

Edward S. Evans, president, and Harold H. Emmons, chairman of the board of the Detroit Aircraft Corp., recently attended a reorganization meeting of the Mahoney-Ryan Aircraft Corp., St. Louis. The name of the concern was changed to Ryan Aircraft Corp. Mr. Evans was elected president and Mr. Emmons was elected a director of the concern.

Rengers Sees Traffic Need

Traffic conditions as he found them on a recent extensive trip in a Gardner sedan through the Middle West and Eastern States, have convinced F. H. Rengers, general sales manager of the Gardner Motor Co., Inc., of the necessity of a uniform traffic law for all states in the Union, if our streets and highways are to continue to function as adequate channels of transportation.

Banford and Mack Named

W. R. Banford has been named service manager of the Dodge Brothers division of Chrysler Motors to succeed Henry M. Wiegand. John H. Mack, formerly director of national business sales of Dodge Brothers, has been appointed head of the national business sales department of Chrysler Motors.



Herbert F. Perkins

Whose election as president of the International Harvester Co., to succeed Alexander Legge was announced last week in Automotive Industries

Tillotson Returns from Europe

Harry C. Tillotson, president of the Tillotson Mfg. Co., and a director of the Willys-Overland Co., has returned to Toledo from Europe. He visited several of the capitals, mostly as a vacation tour. Mr. Tillotson has just been named president of the Toledo Chamber of Commerce.

Briggs Heads New Bond House

Walter O. Briggs, president of the Briggs Mfg. Co., is president of the newly formed Briggs Bond & Investment Co. which has been organized at Detroit with offices in the Buhl Building.

Sorensen Sails for Europe

Charles E. Sorensen, chief engineer of the Ford Motor Co., and Mrs. Sorensen sailed recently on the S. S. Majestic for a business trip to Europe. Mr. Sorensen did not disclose his destination abroad or the nature of his business.

Cooper Now With Auburn

Earl Cooper, veteran of more than 600 automobile races, has joined the experimental engineering department of the Auburn Automobile Co. He retired from racing three years ago to head the Cooper Engine Co.

Webster Joins Cassatt

T. Ellwood Webster, formerly vice-president of the Celoron Co., subsidiary of Diamond State Fibre Co., is now associated with Cassatt & Co., investment bankers.

Stockard On Gotfredson Board

Joel Stockard, president of Joel Stockard & Co., investment bankers, has been elected a director of the Robert Gotfredson Truck Co.

Sky Specialties Corp.

Headed by A. L. Cash

The Sky Specialties Corp., recently organized by Charles B. Bohn and others, to make the Heywood starter for airplanes, is headed by Arthur L. Cash, formerly president and general manager of Northway Motors, a subsidiary of General Motors Corporation, as president.

The directors include Mr. Bohn; S. D. Den Uyl, secretary of the Bohn Aluminum & Brass Corp.; Fred L. Riggin, secretary of the Mueller Brass Works; William B. Stout, president, and Stanley E. Knauss, vice-president of the Stout Air Services, Inc.; Edward F. Roberts, vice-president in charge of production, Packard Motor Co.; John Cowan, Jr., attorney, and S. L. McKay, capitalist.

Franklin Urges Road Building

Fifteen years of "good roads" effort which has given the United States the best roads in the world has, nevertheless, failed to keep pace with modern requirement in the opinion of H. H. Franklin, president of the company which bears his name.

"What road building needs is revolution, not evolution—and revolution which will go out boldly and sweep away boundary lines to make roads straight," Mr. Franklin said recently.

Hoffman Named by Foundation

Paul G. Hoffman, vice-president of The Studebaker Corp. of America, has been named a member of the board of directors of the recently organized Planning Foundation of America. The new organization, created under the laws of New York, is a membership corporation whose purpose is to foster the planning of cities and regions.

D. T. & I. Elects Franklin

Walter S. Franklin has been elected president and S. P. Ruddiman has been named vice-president of the Detroit, Toledo & Ironton Railway. Mr. Franklin was formerly general agent for the Pennsylvania Railroad in Detroit, and recently was appointed general superintendent of the northwestern division.

Procter Joins Van Dorn

R. W. "Doc" Procter, formerly sales manager and recently sales promotion manager of the Black & Decker Mfg. Co., Towson, Md., has been appointed sales manager of the Van Dorn Electric Tool Co., Cleveland, succeeding Lyman H. Bellows, resigned.

Gar Wood's Plane Nearly Ready

Gar Wood, famous speedboat builder and pilot, will become the possessor of the largest privately owned seaplane ever to take the air.

Profit of \$151,138 Earned by Jordan

Earnings for First Half Compare With Loss of \$473,372

CLEVELAND, July 16—The net earnings of the Jordan Motor Car Co. for the first six months of 1929 totaled \$151,138, according to a statement just issued by John McArdle, vice-president and general manager. During the same period last year the company lost \$473,372. Net earnings for June after all charges except Federal taxes amounted to \$31,034 as against a loss of \$52,796 in the same month last year.

"The Jordan company now shows a profit surplus of \$1,278,794," said Mr. McArdle, "which compares with a profit and loss deficit on Jan. 1 this year, of \$2,052,088.

"Current assets on July 1 were \$1,862,731, with current liabilities of only \$258,469, which gives the company a ratio of better than seven to one. And the common stock equity has tripled in the six months just ended." One of the most gratifying factors of the present Jordan situation, according to Mr. McArdle, is the fact that in June when many manufacturers were beginning to show the seasonal let-up, Jordan earnings increased more than 48 per cent over May.

Yale and Towne Mfg. Co. to Buy Stuebing Cowan

STAMFORD, CONN., July 17—The Yale & Towne Mfg. Co., of this city has contracted to purchase the assets of the Stuebing Cowan Co., of Cincinnati and Holyoke, Mass., according to a joint announcement by both companies. Purchase of the Stuebing Cowan Co. will add a complete line of single and multiple lift hand trucks to the Yale & Towne line of devices for the handling of materials.

The sales of the Stamford company will continue to be under the supervision of James C. Morgan, and it is announced that arrangements have been made under which the executive personnel of Stuebing Cowan will enter Yale & Towne. Walter C. Stuebing is to act as assistant to Mr. Morgan, in charge of truck sales, and William Stuebing will continue to act as superintendent of the Cincinnati plant, additions to which are now under construction.

Franklin Estimates Profit

SYRACUSE, N. Y., July 14—Following a record business for the first six months of the current year, indications are that profits of the Franklin Automobile Co. will amount to approximately \$1,250,000 net, after taxes, according to officials. With provisions made for preferred dividends, there remains \$3.50 per common share for the period. Company executives have an-

nounced that every indication points to a continuation of highly satisfactory business during the second half of the year.

Perfect Circle Reports Net Income of \$404,562

HAGERSTOWN, IND., July 15—Earnings of the Perfect Circle Co. in the first five months of 1929 increased 60 per cent over a year ago, it was announced today by C. N. Teetor, president. The net income, after all deductions and charges, amounted to \$404,562 in the five months ended May 31, compared with \$253,859 in the same period of 1928. In the month of May alone net income after taxes was \$102,977.

If earnings are maintained at the present rate of increase the showing for the full year should be better than \$7 a share on the 162,500 shares of no par value stock outstanding, it is said. Perfect Circle has been stepping up production to record levels and in May produced 5,015,000 piston rings, a new all-time high.

Intensive developments of the two new outlets has been inaugurated by the company. These are the aviation industry and the export trade. Heretofore the company has not pushed sales of its piston rings in these fields because of the inadequate production, but with the recent increase in plant capacity, output has been considerably increased. The company, it is announced by Lothair Teetor, vice-president in charge of sales, now has agents and stocks in fifty-seven countries.

Stock Deposits Asked

NEW YORK, July 15—Stockholders in the 11 aircraft manufacturing and flying service organizations recently combined to form the Curtiss-Wright Corp., have been urged to deposit their stocks and exchange for stock in the new company. Aug. 15 has been set as the date on which final stock deposit for this exchange must be completed.

Airway Issue Approved

DETROIT, July 13—The Michigan Public Utilities commission has granted the application of James D. Foster, of Lansing, Mich., and other persons, for permission to issue 70,000 shares of non-par value stock in the formation of an experimental and commercial airplane company, the Foster Airways Corp., Lansing.

Year's Output is Sold

DETROIT, July 13—The Motor Products Corp., manufacturer of automobile and airplane accessories, reports that contracts recently arranged with the Ford Motor Co. assure capacity operation for the next 12 months at both the American and Canadian plants.

Producing New Tractor

LAPORTE, IND., July 16—Production of a new tractor with a tread of 46 in. is under way at the Advance-Rumely Co. plant here.

Financial Notes

National Aviation net earnings in first six months approximated \$1,100,000 after all charges and taxes, equal to \$5.50 per share on 200,000 shares outstanding. These earnings do not include paper profit on securities held in treasury which as of June 30 totaled more than \$2,300,000 or over \$11 a share on the outstanding stock. The figure is also exclusive of options on stock which is received for underwriting organization and management activities which have present market value of over \$1,500,000 or \$7.50 a share on outstanding stock and with a much larger potential value.

Commercial Investment Trust Corp. has signed an insurance contract to be used as the basis of its future time sales financing in the aviation field. This contract has been developed in cooperation with two strong old line insurance companies for the purpose of furnishing maximum protection not only to the finance company, but to the individuals and air line operators who purchase planes on the time-payment basis.

Wolverine Screw Co. has placed its common stock on an annual dividend basis of \$1 per share. The initial quarterly dividend is payable Sept. 1 to stockholders of record Aug. 20. A. C. Germer, president, states that the company is operating at capacity with a day and night shift, and that the only capital liability of the company is the 75,000 shares of common stock.

Aero Corp. of America recently formed to acquire Simplex Aircraft Corp. and the Covert Gear & Mfg. Corp. is floating an issue of 101,634 shares of common stock. The corporation has no funded debt or preferred stock and this offering will bring outstanding common stock up to 184,000 shares.

Aviation Corp. of the Americas and subsidiaries report a net loss for the period from its organization in June, 1928, to Dec. 31, 1928, of \$29,659. Balance sheet as of Dec. 31 shows total assets of \$3,444,030 with current assets at \$2,043,245 and current liabilities of \$94,843.

L. A. Young Spring & Wire Corp. reports net profit of \$1,524,325, after taxes and other charges, for the first six months of 1929, establishing a new record in the company's history and exceeding the corresponding period of last year by more than 34 per cent.

Porter-Cable Machine Co. of Syracuse, has purchased the Emmert Oscillating Spindle Sander formerly manufactured by the Emmert Mfg. Co. of Waynesboro, Pa., and will continue its manufacture now in its own plant.

New Standard Aircraft Corp., Paterson, N. J., has issued to stockholders rights to subscribe to additional shares of stock at \$15 a share on the basis of one new share for each four shares held.

Muskegon Motor Specialties Co. income account for the first six months of 1929 is expected to show net earnings after all charges, including depreciation and taxes, in excess of \$300,000.

Knudsen Says Public Dictates Pace of Manufacturing, As June Breaks Records

DETROIT, July 16—Record public acceptance of low-priced six-cylinder automobiles, according to W. S. Knudsen, president and general manager of the Chevrolet Motor Co., has made necessary the record performance of the 16 factories in producing 845,469 units of the six-cylinder Chevrolet.

"The automobile buying public has been the dictator of our manufacturing pace," he said.

"We are gratified to see the steadily increasing demand. It is a tribute to the vision of our engineering staff that worked for four years to design and perfect the new six-cylinder valve-in-head motor.

"Great credit is due the manufacturing division which has worked unceasingly to accommodate the demand and in so doing has been responsible for achievements that have made industrial history in the production of the new

Chevrolet six.

"This is all the more remarkable when it is considered that volume production on Chevrolet's scale must be accompanied by exact precision manufacturing so that waste will be eliminated and so that production lines will not be held up as a result of having to replace a part because of defective materials or workmanship."

Mr. Knudsen declared that the summer production level will be considerably higher than in former years. He called attention to the fact that in practically every section of the country dealers are still behind orders and that demand in other sections continues to absorb the dealer supply almost as rapidly as cars are received from the factory.

Output for June was 151,297 cars and trucks—nearly 20,000 units greater than the best previous June on record.

Nash Ships 168,269 Cars of "400" Series in Year

KENOSHA, WIS., July 17—The "400" Series Nash cars, which were introduced on June 21, 1928, have completed their first anniversary of public service with a sales record greater by thousands of cars than the sales of any previous twelve months on the books of the Nash Motors Co.

C. H. Bliss, general sales manager, in footing up factory sales totals from June 21, 1928, to June 20, 1929—the period in which the "400" Series completed their production and sales anniversary—found today that 168,269 of these cars were shipped from the Nash factories.

This record does not consider the usual fiscal year, but takes the new series through their first birthday with a total of 32,748 units over and above the totals shipped in the best previous twelve months of Nash manufacturing. The biggest twelve months experienced by Nash previous to the advent of the "400's" came in 1926, when 135,521 Nash cars were shipped from the factories.

Standards Group Formed

WASHINGTON, July 18—The Department of Commerce this week announced the creation of Trade Standards and Specifications Divisions of the Commercial Standardization Group of the Bureau of Standards.

Discuss Air Mail Economy

WASHINGTON, July 18—Postmaster General Brown and the four assistant postmasters general conferred with President Hoover this week on means for making the air mail service more nearly self-supporting. Following the conference the postmaster general

stated this would have to be brought about by a greater volume of air mail or by reducing the rates paid to contractors.

Parmelee Gets Interest in Pittsburgh Company

NEW YORK, July 17—The Parmelee Transportation Co. has acquired a substantial interest in the Yellow Cab Co. of Pittsburgh, thus adding a third unit to its chain of affiliations. This company was recently organized to take control of the Yellow Taxi Co. of New York and the Yellow Cab Co. of Chicago.

Under the new management the Pittsburgh company will replace its present four-cylinder equipment with new six-cylinder cabs of the town car type.

Allison Expansion Started

INDIANAPOLIS, IND., July 17—Razing of several storage buildings to make way for the \$500,000 expansion program of the Allison Engineering Co., recently taken over by the General Motors Corp., has been started here. The Allison plant has been devoted largely to experimenting with Diesel engines and while details of the expansion are not known it is understood that General Motors plans to put the Allison company in the front ranks of the nation's aviation industry.

Whittelsey Appoints Distributors

NEW YORK, July 17—The Whittelsey Mfg. Co. of Bridgeport, Conn., has announced the appointment of a number of distributors for the Whittelsey Avian Airplane throughout the country.

Bosch Gets Restraining Order

WASHINGTON, July 18—A temporary restraining order was issued by the Supreme Court of the District of

Columbia this week enjoining the Commissioner of Patents from canceling the trademark "Bosch" issued to the American Bosch Magneto Corp. of Springfield, Mass. The corporation has applied for a permanent injunction against the Commissioner of Patents.

Lamont Names Committee on Distribution Census

WASHINGTON, July 18—Fourteen business men and economists were appointed by Robert P. Lamont, Secretary of Commerce, as a committee to aid in the formulation of plans for taking the first national census of distribution next year. The committee held its first meeting here this week.

Members of the committee are as follows: F. M. Feiker, Associated Business Papers, Inc., New York; Dr. F. M. Surface, assistant director, Bureau of Foreign and Domestic Commerce; Sydney Anderson, president, Millers' National Federation, Washington, D. C.; Dr. L. D. H. Weld, H. K. McKann Co., New York; Dr. Melvin T. Copeland, Harvard University; W. E. Freeland, Freeland & Warren, Inc., Boston.

E. D. Borden, U. S. Chamber of Commerce; William N. Taft, Retail Ledger, Philadelphia; C. J. Whipple, president, Hibbard, Spencer, Bartlett Co., Chicago; Henry S. Dennison, The Dennison Mfg. Co., Framingham, Mass.; E. M. West, Dodd & West, New York; F. A. Gosnell, Brumback Realty Co., Clarendon, Va.; Paul T. Cherington, J. Walter Thompson Co., New York; and Herbert P. Sheets, National Retail Hardware Association, Indianapolis, Ind.

The census advisory committee has agreed to name at least four groups to deal with distribution, population, manufactures and unemployment aspects of the coming census.

A.A.A. Forms Air Group

WASHINGTON, July 18—Formation of an air travel division was announced this week by the American Automobile Association. Thomas P. Henry, president of the association, stated that within a short time the affiliated clubs will be able to chart, arrange and handle all details for a journey to any part of the world and including every form of conveyance.

Japan Has 17 Airports

WASHINGTON, July 18—Seventeen airports are now available for civil aeronautics in Japan, says a report received by the Commerce Department this week from Vice-Consul George J. Haering, Kobe. Seven are land airports, seven marine, one international in Japan proper and two in Chosen.

Industrial Trucks Show Drop

WASHINGTON, July 18—June shipments of electric industrial trucks and tractors, as reported by the 11 leading manufacturers in the industry, were 201, as compared with 211 in May and 116 in June, 1928, according to the Department of Commerce.

Skinner to Build Plant at Oshawa

First Factory to Result From
City's Efforts Will Make
Bumpers

OSHAWA, ONT., July 17—Bids will be called within a few days for the construction of a factory at Oshawa for the Skinner Co., Ltd., according to Frederick J. Skinner, M.P.P., president. The building, which will be 128 by 360 ft. in size and one-story high, will be the first unit of a factory building program to be undertaken by the Skinner company in Oshawa, and will be used for the manufacture of automobile bumpers, as previously reported in *Automotive Industries*.

It is expected that production operations will be started by the end of November. The Skinner factory was the first obtained by the Oshawa Chamber of Commerce in an intensive campaign for industries recently undertaken.

The Oshawa Chamber was successful in persuading the Ontario Legislature to pass a bill allowing municipalities to buy lands for the establishment of Industrial Areas, and the city council of Oshawa has taken an option on 30 acres, near the Oshawa harbor which is to be deepened this year, and adjacent to a large level tract of land which it is proposed to develop into an airport for both land and water planes. Additional land in this vicinity may also be secured by the council at a later date. The Skinner company has purchased six and one-half acres of this area. Another concern, the identity of which has not yet been divulged, is also negotiating for land.

Burst Reports Increase in Windsor Car Sales

ST. LOUIS, July 16—Latest available figures show the Windsor White Prince gained 32 per cent in Illinois during the first six months of this year as against the same period in 1928.

"We have no doubt," said C. W. Burst, president of the Windsor Corp., "but what this percentage will be doubled by the time final figures are checked. This gain in sales is only a repetition of what the Windsor has done in California where a gain of over 190 per cent has been made. In the Eastern section our percentage of gain has been well over 200."

George Kublin, vice-president and chief engineer, has announced that Duco sheet metal fenders can now be furnished on any of the company's models.

Prevalence of U. S. Cars Shown

WASHINGTON, July 18—Of a total of 32,028,500 automobiles in world circulation, 28,551,500, or more than 90 per cent, were manufactured in the United States, according to a statement issued this week by the automotive divi-

sion of the Department of Commerce. This figure, it is pointed out, includes 24,567,000 passenger cars, over 91 per cent of the world total, and 3,984,500 trucks, almost 80 per cent.

West Coast Transport is Obtained by Group

PORTLAND, ORE., July 16—Purchase of the controlling interest of the West Coast Air Transport Co. of Portland by a group of aviation leaders headed by James A. Talbot and Harris M. Hanshue, both of Fokker Aircraft Corp. and Western Air Express has been announced. The organization will be known as the West Coast Air Transportation Corp. and will operate passenger and freight air lines between San Francisco, Portland and Seattle, and later a connection will be made with the lines of Western Air Express, the exchange point being San Francisco.

Officers of the new company will include Harris M. Hanshue, president; James A. Talbot, vice-president; Bradford M. Melvin, vice-president; R. W. McKee, secretary-treasurer. These men, with Robert E. Smith, also will serve as directors.

Crude Rubber Active

NEW YORK, July 17—Trade in crude rubber last week was somewhat more active with prices showing an advancing tendency during the early part of the week, but shading off again as the week ended, according to F. R. Henderson Corp.

June consumption of crude rubber was 42,800 tons. Stocks on hand and afloat at the end of June were 138,098 tons as compared with 130,199 at the end of June last year and with 152,596 at the end of May this year.

Stocks in London decreased last week to 30,004 tons. Arrivals to all ports of the United States during the first twelve days of July are estimated at 69,000 tons.

Rubber Imports Increase

NEW YORK, July 16—Imports of crude rubber into the United States during July totaled 44,490 long tons, according to estimates issued by the Rubber Manufacturers Association. This compares with 25,792 tons for June last year and with 49,180 tons in May of this year. Imports for the six months ended June 30 are estimated at 318,508 tons as against 212,497 tons for the corresponding period last year.

Chrysler Plant Reopened

NEW CASTLE, IND., July 17—Operations at the Chrysler automobile plant here have been resumed following the installation of new machinery. Working forces have been increased from 1100 to 3000 and prospects point to steady operation with the peak being reached about Aug. 1. The new equipment is said to have been for the manufacture of a new four-speed transmission.

Canadian Exports Reported \$4,230,536

Government Figures for May
Show Increase of 49.8
Per Cent

WASHINGTON, July 18—Canadian exports of motor vehicles during May totaled 9561 units valued at \$4,230,536, an increase of 45 per cent in number and 49.8 per cent in value over April exports, according to a statement made public this week by the Automotive Division of the Department of Commerce.

Shipments of low-priced passenger cars increased 21 per cent while shipments of medium-priced cars doubled. Exports of trucks and buses showed a larger increase, those of a capacity of one ton or less advancing 79 per cent and over one ton, 23 per cent.

Production declined 24 per cent compared with April, although it compared favorably with May, 1928, the peak month of that year, the report points out. Production during the first five months of 1929 numbered 166,869 units, an increase of 72 per cent over the output in the January-May period of 1928, when 96,589 units were produced. The average value of passenger cars exported during May was \$465, as compared with \$445 in April.

New Zealand ranked first as a market for Canadian passenger cars during May, shipments to this country more than doubling. Argentina dropped to second place although this country was the best market for passenger cars valued from \$500 to \$1,000. The United Kingdom dropped from third to sixth place and British South Africa advanced to third place, the report states. Spain, Australia and British India continued as the best truck markets.

Peerless Announces Gain in Six Months' Shipments

CLEVELAND, July 15—Peerless shipments for the first half of 1929 were 26 per cent greater than those during the same period of last year, according to executives of the company. This is in spite of the fact that the new straight eight was not offered to the public until May. This model has proved to be the finest car produced so far in the big Cleveland factory.

Peerless export business has increased even in greater proportion than domestic sales. Overseas shipments during the six months were far in excess of those of the entire year of 1927, and more than two-thirds as great as those of all last year.

Curtiss-Caproni Gets Permit

BALTIMORE, July 17—The Curtiss-Caproni Corp. has been awarded a permit to construct the first unit of its airplane plant adjoining the new municipal airport here. The plans call for three buildings to cost about \$400,000.

Houdaille-Hershey Certificates Ready

DETROIT, July 16—Certificates of Class "A" and Class "B" stock of the Houdaille-Hershey Corp. are now available for exchange for the certificates of deposit of General Spring Bumper Corp., issued under the agreement to combine the two concerns. The necessary Houdaille-Hershey stock to carry the plan into effect has been authorized for listing on the New York, Detroit and Chicago stock exchanges.

A communication mailed to stockholders of General Spring Bumper a few days ago stated that more than 87 per cent of the outstanding stock of the corporation had been deposited. It was also announced that no transfer of certificates could be registered after July 23, after which date the books of the committee would be permanently closed.

Although no further General Spring Bumper stock will be accepted for deposit, the board of directors of Houdaille-Hershey has authorized, until further notice, that Houdaille stock will be issued upon the same basis directly to holders of undeposited Bumper stock upon surrender of Bumper certificates.

G. E. Orders Up 32 Per Cent

NEW YORK, July 16—Orders received by the General Electric Co. for the three months ended June 30 amounted to \$119,351,248, compared with \$90,431,957 for the corresponding quarter of 1928, an increase of 32 per cent, President Gerard Swope has announced. For the six months ended June 30, orders amounted to \$220,716,456.

German Tax Recommended

WASHINGTON, July 18—The German Automobile Manufacturers Association has received a report from its commission which recently visited the

Car Origin Ruling is Made by Spain

WASHINGTON, July 18—According to a recent ruling by Spanish customs authorities, automobiles, which are assembled in Antwerp, Belgium, from parts coming from the United States and which undergo manipulations in Belgium in the form of mounting, upholstering, finishing or other cooperation which may be considered to affect an increase in value, are required to be accompanied by a certificate of origin of the country in which these manipulations take place, says a Madrid report received at the Commerce Department this week.

United States recommending a uniform gasoline tax similar to that in this country, it was announced at the Commerce Department. It is recommended in the report that the gas tax replace the present types of motor taxation in Germany. Manufacturers are skeptical about the recommendation, fearing that the government might adopt the gas tax recommendations without removing the existing vehicle taxes.

Tire Sales in Sweden Drop

WASHINGTON, July 18—Extreme cold weather during the first quarter of this year had a very unfavorable influence upon automobile tire sales in southern Sweden, according to a report received this week from Consul R. A. Boernstein, Malmo, by the Department of Commerce. American-made automobile tires predominate in southern Sweden and about 10 different makes are sold in this section, it is stated.

A.C.C. Announces Exhibition Plans

NEW YORK, July 15—The Aeronautical Chamber of Commerce of America will hold its 1930 National Aircraft Show in St. Louis some time next February, according to an announcement by Charles L. Lawrance, chairman of the show committee.

The Chamber has also sanctioned the Third All-American Aircraft Show to be held in Detroit, April 5 to 13. Most of the manufacturing members of the Chamber will exhibit in the national show at St. Louis, which promises to be bigger and more representative than the show held last year in Chicago.

The show will be staged in the two National Exhibition buildings on Oakland Ave., giving a total floor space of 172,000 ft., together with a covered arena located between them giving 31,500 additional sq. ft.

Martin Orders, \$3,168,000

BALTIMORE, July 17—The Glenn L. Martin Co. has been awarded additional contracts for government airplanes amounting to \$971,895. This brings the company's total contracts for the government since the local plant was established early this year to \$3,168,000. New contracts are for nine twin-motored patrol flying boats to cost \$614,393, a torpedo plane to cost \$150,000, a patrol flying boat to cost \$150,000 and spare parts to cost \$122,502. All the equipment is for the Navy.

Noblitt Sales Increase

INDIANAPOLIS, IND., July 17—Gross income from sales of Noblitt-Sparks Industries, Inc., manufacturer of automobile accessories with factories in three nearby cities, during the month of May, totaled \$402,667, representing an increase of \$155,332 over the same month of last year.

Calendar of Coming Events

SHOWS

International Aircraft Exhibition, Olympia, London July 16-27
International Aircraft Exhibit, Coliseum, Chicago Sept. 7-15
National Machine Tool Builders' Exposition and Congress, Cleveland, Sept. 30-Oct. 4
Paris, Automobiles Oct. 3-13
London, Automobiles Oct. 17-26
Prague, Automobiles Oct. 23-30
Paris, Motorcycles Oct. 23-Nov. 3
M.&E.A. Show and Convention, Chicago Nov. 4-9
N.S.P.A. Show and Convention, Detroit Nov. 11-16
Berlin Auto Salon Nov. 14
London, Trucks Nov. 7-16
Paris, Trucks Nov. 14-24
London, Motorcycles Nov. 30-Dec. 7
Brussels Auto Salon Dec. 7
New York National Jan. 4-11
Chicago National, Coliseum Jan. 25-Feb. 1

CONVENTIONS

National Association of Show and Association Managers, Meeting, Chicago July 25-26
Second Pan-American Congress of Highways, Rio de Janeiro Aug. 16-31
American Welding Society, Fall Meeting and Exposition, Cleveland Sept. 9-12

American Institute of Mining and Metallurgical Engineers, Cleveland, Sept. 9-12
American Society for Steel Treating, Convention and Exposition, Cleveland Sept. 9-13
American Chemical Society, Fall Meeting, Minneapolis Sept. 9-13
A.S.M.E.—Iron and Steel Division—National Meeting, Cleveland Sept. 9-13
Society for Electrical Development, New York City Sept. 13
Eastern States Exposition, Springfield, Mass. Sept. 15-21
American Electric Railway Association, Atlantic City Sept. 28-Oct. 4
National Industrial Advertisers Assn., Cincinnati Sept. 30-Oct. 2
National Safety Congress, Annual, Chicago Sept. 30-Oct. 4
Penna. Automotive Association, Erie, Pa. Oct. 7-8
Permanent International Association of Road Congresses, Sixth Session, Washington, D. C. Oct. 7-11
Society of Industrial Engineers, Detroit Oct. 16-18
National Hardware Association, Atlantic City Oct. 21-24
World Engineering Congress, Tokio, Japan Oct. 29-Nov. 22
National Automotive Parts Association, Detroit Nov. 6-8

Highway Research Board, Ninth Annual Meeting, Washington, D. C. Dec. 12-13
National Automobile Dealers Association, New York City Jan. 6
National Automotive Dealers Association, Chicago Jan. 27-28

RACES

Spanish Grand Prix July 31
British Tourist Trophy Race Aug. 17
Akron Aug. 18
National Air Races and Show, Cleveland, Aug. 24-Sept. 2
European Grand Prix, Italy Sept. 8
Syracuse Aug. 31
Altoona, Pa. Sept. 2
Cleveland Sept. 15

S. A. E.

Aeronautic Meeting, Cleveland Aug. 26-28
Production Meeting, Cleveland Oct. 2-4
Annual Meeting, Detroit Jan. 21-24

SALONS

Hotel Drake, Chicago Nov. 9-16
Hotel Commodore, New York City Dec. 1-7
Hotel Biltmore, Los Angeles Feb. 8-15
Palace Hotel, San Francisco Feb. 22-Mar. 1